DOCUMENT RESUME

ED 129 988 CE 007 886

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TITLE Teaching Guide for Still Photographic Technician Aide Occupations.
INSTITUTION National Evaluation Systems, Inc., Amherst, Mass.
SPONS AGENCY Illinois State Office of Education, Springfield. Div. of Adult Vocational and Technical Education.
REPORT NO VT-103-245
PUB DATE 76
CONTRACT PCB-A6-012
NOTE 135p.; For related documents, see CE 007 882-885

EDRS PRICE MF-$0.83 HC-$7.35 Plus Postage.
DESCRIPTORS Curriculum Development; *Laboratory Technology; Learning Activities; *Occupational Information; *Performance Based Education; *Photography; Secondary Education; Skilled Occupations; *Task Analysis; Teaching Guides; Technical Occupations; Vocational Education
IDENTIFIERS *Photographic Technician Aides

ABSTRACT

This teaching guide for still photographic technician aide is one of a series of five performance-based secondary level guides for vocational education. Part 1 provides tools, resources, and a process to be used at the local level to develop a still photographic technician aide training curriculum. It includes a comprehensive overview of the career field; a performance-based listing of job tasks and related learning objectives at the entry level; a method for developing learning activity packages; two sample learning activity packages; descriptions of eight commonly used teaching methods; and a listing of instructional resources. Part 2 offers the guidance counselor career information and recommends steps to determine criteria for student selection and placement in the training program. It includes a theoretical framework for guidance activities; a description of the general aptitude test battery; a composite profile of the entry-level worker; a listing of instructional units of a widely used remediation program; the Worker Trait Codification System (from the "Dictionary of Occupational Titles"); descriptions of related jobs; and job titles associated with the principal worker trait group identified for the entry-level worker. (NJ)

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ED129988

TEACHING GUIDE FOR
STILL PHOTOGRAPHIC TECHNICIAN AIDE OCCUPATIONS

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Teaching Guide for Still Photographic Technician Aide Occupations was produced by National Evaluation Systems, Inc., Post Office Box 226, Amherst, Massachusetts 01002, under Contract No. PCB-A6-012 with the Illinois Department of Adult, Vocational and Technical Education.

CE 007 896

ACKNOWLEDGMENTS

We wish to thank the following people and organizations for their valuable contributions to the research, conceptualization, and development of the teaching guide.

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U.S. Civil Service Information Center
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U.S. Department of Labor
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U.S. Employment Agency
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Eastman Kodak Company
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Polaroid Corporation
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PREFACE

This teaching guide is linked to a national vocational information system which is performance-based and employer-based. It offers the secondary-level instructor, guidance counselor, student, and administrator the results of an occupational analysis of the career field and presents a core of resources that can be used to develop a training curriculum at the local level. It also provides a description of the basic competencies required for advancement within the field.

The guide presents the secondary school instructor and student with statements of the actual job skills required to perform at the entry level and is backed by the knowledge requirements of the photographic technician field. For the curriculum designer, the guide provides a logical system of information—job tasks, learning objectives, a suggested instructional methodology, sample learning activity packages, and teaching resources—that is adaptable to local secondary school needs and resources. For the guidance counselor, the guide offers information and suggestions for determining the prerequisite learning needs of individual students and recommends diagnostic tools for placing students in the training program. The school administrator can use the guide as a planning and evaluative tool to strengthen existing programs or develop new ones. All users of the guide should familiarize themselves with each section so that maximum use may be made of the guide in curriculum development efforts.

The guide is divided into two parts: Part One, "Guide for Curriculum and Instructional Development" (Sections 1.1–1.7), and Part Two, "Guide for Student Selection and Placement in the Training Program" (Sections 2.1–2.7).

PART ONE: GUIDE FOR CURRICULUM AND INSTRUCTIONAL DEVELOPMENT

SECTION 1.1, "How to Use Part One of the Guide," presents a recommended, step-by-step method for using Sections 1.1–1.7. Included in the section are steps for: Background and Review, How to Plan Your Course, How to Develop Instructional Units, and Student Selection and Placement.

SECTION 1.2, "How the Guide Was Developed," explains the structure and development of the guide and the definitions of key concepts: occupational analysis, worker trait group, task statement, task inventory, learning objective, and career ladder.

SECTION 1.3, "General Job Description: Still Photographic Technician Aide," provides a comprehensive overview of the career field, descriptions of the type of work performed, employment forecasts, and other important career information.

SECTION 1.4, "Inventory of Job Tasks and Learning Objectives," presents a performance-based listing of job tasks and related learning objectives at the entry level. The entry-level tasks represent the significant learner outcomes of the training program; they are the core materials upon which curriculum development efforts can be based. Also presented are task inventories at the intermediate and advanced levels to support the career ladder concept and to provide continuity for the establishment of curricula beyond secondary school.

SECTION 1.5, "How to Develop Learning Activity Packages," explains a method for developing learning activity packages from the performance-based tasks and learning objectives. Two sample learning activity packages are presented—one based on a task and its learning objective and one based on basic mathematical skills.

SECTION 1.6, "How to Select an Instructional Method," describes the uses, advantages, and disadvantages of eight of the most commonly used instructional methods and the factors involved in selecting the most appropriate method for a given learning situation.

SECTION 1.7, "Teaching-Learning Resources for the Instructor," provides the instructor with a variety of instructional resources and references for use in curriculum and instructional development efforts.

PART TWO: GUIDE FOR STUDENT SELECTION AND PLACEMENT IN THE TRAINING PROGRAM

SECTION 2.1, "How to Use Part Two of the Guide," offers the school guidance counselor a step-by-step method for using Sections 2.1–2.7.

SECTION 2.2, "Career Guidance for Still Photographic Technician Occupations," provides a theoretical framework for guidance activities in the training program and describes the General Aptitude Test Battery which can be used for student selection and placement.

SECTION 2.3, "Qualifications Profile for the Entry-Level Still Photographic Technician Aide," presents a composite profile of the entry-level worker and is based on worker traits associated with this career field from the Dictionary of Occupational Titles.

SECTION 2.4, "The Advanced General Education Program," lists the instructional units contained in a widely used remediation program.

SECTION 2.5, "Worker Trait Codification System," is excerpted from the Dictionary of Occupational Titles and provides an explanation of all the knowledge, aptitude, and interest levels associated with worker trait groups.

SECTION 2.6, "Related Jobs at Entry, Intermediate, and Advanced Levels," is included in the guide to suggest the job and career mobility that results from training as a still photographic technician aide.

SECTION 2.7, "Related Jobs by Worker Trait Group," presents job titles associated with the principal worker trait group identified for the entry-level worker.

PART ONE

GUIDE FOR CURRICULUM
AND
INSTRUCTIONAL DEVELOPMENT

SECTION 1.1
How to Use Part One of the Guide

Part One of the guide provides tools, resources, and a step-by-step process that can be used at the local school level to develop a still photographic technician aide training curriculum and supporting instructional activities. The steps listed below present a recommended method for using the sections in Part One of the guide. The user is encouraged to follow these steps so that the best possible use of the guide can be made.

The **Background and Review** steps provide the user with a comprehensive overview of the still photographic technician field and an explanation of the procedures used to develop the guide. The steps included in **How to Plan Your Course** offer a detailed procedure for using key sections of Part One to develop an up-to-date, job-related curriculum. The steps under **How to Develop Instructional Units** build on the course-planning steps and provide useful models for the development of learning activity packages which are responsive to local needs. The **Student Selection and Placement** steps offer suggestions to the instructor for coordinating course development activities with the student selection and placement activities of the school guidance counselor.

BACKGROUND AND REVIEW

STEP 1: Review how the guide was developed. Read Section 1.2, "How the Guide Was Developed," to gain a thorough understanding of the structure and development of the guide and to become familiar with these key concepts and terms: occupational analysis, worker trait group, task statement, task inventory, learning objective, and career ladder.

STEP 2: Review the information on the still photographic technician career field. Read Section 1.3, "General Job Description: Still Photographic Technician," for an overview of the career field, descriptions of the type of work performed, employment forecasts, and other important career information.

STEP 3: Review the job tasks and learning objectives. Study Section 1.4, "Inventory of Job Tasks and Learning Objectives," to gain another perspective on the career field. This section presents a performance-based listing of still photographic technician job tasks at the entry, intermediate, and advanced levels and the entry-level learning objectives. The tasks represent the significant learner outcomes of the training program; they are the core materials upon which curriculum development efforts can be based.

HOW TO PLAN YOUR COURSE

STEP 1: Examine each entry-level task and its associated learning objective. The entry-level tasks and objectives form the building blocks of a performance-based curriculum. Consider what is meant by each task and objective statement listed in Section 1.4, how it differs from other statements in the inventory, and how it relates to: the needs of your student population; the educational priorities of your school; the facilities, equipment, and instructional materials available; and the time available for instruction.

STEP 2: Rank the tasks and objectives in the order of their importance. Keeping in mind the educational priorities, needs, and resources of your school and students, rank all the entry-level tasks and objectives in the order of their importance. Your first efforts should be to divide them into more manageable clusters, such as: 1 = most important, 2 = average importance, and 3 = less important. Then, rank the tasks and objectives within each of these clusters. The end result of this effort is a ranked list of task and learning objective statements ranging from most important to least important with regard to your educational priorities, needs, and resources. If an advisory committee or another group of educators is involved in course planning, their ranking of the inventory should be done independently.

STEP 3: **Independently rerank the tasks and objectives.** After a short period of time has elapsed (one or two weeks), each advisory committee member or other persons who ranked tasks and objectives should repeat Steps 1 and 2. Do not refer to your initial rankings during this step.

STEP 4: **Resolve any differences in the rankings.** In order to improve the reliability of the rankings, resolve any differences through group discussions among the rankers and a reexamination of the tasks and their associated objectives.

STEP 5: **Review your ranked entry-level list.** For the finalized, ranked list of tasks and objectives, determine if you have a manageable number to teach in the time allotted for the training program. Drop the lowest-ranked statements until a manageable number is reached.

STEP 6: **Sequence your entry-level task and objective list.** The order in which the tasks and objectives are presented is the suggested sequence for instruction. However, you may need to make adjustments to this sequence depending on local school needs, time, and resources. There are two basic ways to sequence learning: one is based on the order in which the tasks are performed on the job, and the other is based on a building block concept. These two methods are described below. In actual practice, both sequencing methods have their place in course development. Deciding which method to use will depend on the content and performance required in a particular task or group of tasks.

- Method 1: Job Performance Order. This method provides the student with training in performing a group of tasks as they actually would be performed on the job. The sequence may be determined through employer interviews, the establishment of an occupational advisory committee, or collaboration with local training directors or supervisors.

- Method 2: Building Block Learning. The building block method means that the initial, prerequisite skills and knowledge taught serve as basic building blocks for subsequent instruction. In general, a student should progress from the simple to the complex, from the familiar to the unfamiliar, and from the concrete to the abstract. Easily learned tasks or broad concepts that have application throughout the course should be placed at the beginning of the course. Similarly, more complex tasks that depend on the mastery of several simpler tasks should be placed near the end of the course.

STEP 7: **Contact employers of still photographic technicians in your local area.** In your course planning you should acquaint local photographic personnel with your course of studies, approach, and instructional activities. They may be able to provide some useful suggestions about involving students in cooperative education programs, volunteer projects, and field trip activities.

HOW TO DEVELOP INSTRUCTIONAL UNITS

STEP 1: **Review the basic principles of learning.** In Section 1.5, "How to Develop Learning Activity Packages," a list of basic learning principles is presented which support all types of learning activities. The principles may be applied to instructional units based on either the tasks or the learning objectives you selected.

STEP 2: **Examine the process for developing learning activity packages.** Study Section 1.5 to become familiar with the process used to develop learning activity packages which utilize the performance-based tasks and learning objectives. Section 1.5 provides two sample learning activity packages—one based on a task and its associated learning objective and one based on the mathematical skills of approximation and estimation.

STEP 3: Develop your own learning activity packages. Design your own packages based on the process described in Section 1.5. Blank worksheets are provided at the end of Section 1.5 for this purpose.

STEP 4: Select methods of instruction and supporting activities. Use the following sections of the guide to support each learning activity package: Section 1.6, "How to Select an Instructional Method," and Section 1.7, "Teaching-Learning Resources for the Instructor."

STUDENT SELECTION AND PLACEMENT

STEP 1: Review the guidance sections in Part Two of the guide. Review the sections in Part Two of the guide to gain an understanding of how the guidance activities relate to and support your curriculum and instructional development activities. It is especially important to review Section 2.3, "Qualifications Profile for the Entry-Level Still Photographic Technician Aide."

STEP 2: Coordinate your efforts with the school guidance counselor. Discuss student selection and placement activities with the school guidance counselor in order to establish criteria for selection and placement of students in the training program.

SECTION 1.2
How the Guide Was Developed

The teaching guide for still photographic technician aide occupations represents a significant step in the development of training programs that are closely linked with employer requirements and employment opportunities. It is based on the premise that students should be trained in the actual job skills identified by photographic personnel and employers for entry-level positions. Its aim is to put into the hands of secondary-school educators at the local level a core of materials that can be used to develop a training program based on their needs and resources. This section of the guide describes the procedures used to develop the teaching guide and provides the background information needed for effective use of each section.

Development of the teaching guide began with the identification of a family of jobs within the field which were related through their required levels of performance and knowledge. Extensive use was made of the Dictionary of Occupational Titles (D.O.T.),* U.S. Civil Service Commission documents, and related supplements in identifying job families.

The criteria used for selecting jobs that would, in effect, define the field included:

Broad Entry-Level Tasks. Jobs were selected which required the performance of a broad range of entry-level skills and knowledge when compared to related jobs.

Job Mobility. Jobs were selected that entailed skills and knowledge which could be applied to jobs higher on a career ladder concept beginning at the semi-skilled or entry level and proceeding upward, job by job, to the advanced level. Jobs that did not provide an opportunity for upward mobility within the career field were screened out.

Career Flexibility. Job skills and knowledge which could be applied to jobs outside the field were selected. This criterion reflected concern for students who might partially or entirely finish the training program and then decide to enter another career field.

Future Employment Opportunities. Available employment forecasts were used to select jobs for inclusion in the job family for which there was an anticipated need nationwide.

Training Time Requirements. Jobs were selected for which entry-level training could be completed within a two-year program.

Training Flexibility. Jobs were screened in terms of their projected training cost, support requirements, and facilities required.

After this composite picture of the still photographic technician field had been produced by defining a representative family of jobs, title jobs were selected to represent the job family at the entry, intermediate, and advanced levels of performance. Encompassing the broadest range of skills and knowledge within the job family, the title jobs chosen were: still photographic technician aide (entry level), still photographic technician (intermediate level), and photographic laboratory manager (advanced level).

The next step involved generating a list of tasks and associated learning objectives to represent the basic skills and knowledge required at the entry level. This step was based on a careful analysis of the D.O.T., U.S. Civil Service Commission Position-Classification standards, and employer interviews. Existing inventories of still photographic technician tasks and learning objectives were collected and evaluated, including an extensive task-objective inventory developed and validated by the U.S. Air Force. The inventories appearing in this guide are the result of this analysis and evaluation.

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* U.S. Department of Labor. Dictionary of Occupational Titles (Vol. 1, Definition of Titles; Vol. 2, Occupational Classification) (3rd ed.). Washington, D.C.: U.S. Government Printing Office, 1965.

In support of the entry-level inventories, task statements were compiled and evaluated at the intermediate and advanced levels. The higher-level task inventories indicate the competencies and knowledge required as the worker progresses up the career ladder. All three task inventories (entry, intermediate, and advanced) are conceived as a core of job performance skills which can be adapted to local educational needs and available school resources.

The final task and learning objective inventory at the entry level (and the intermediate- and advanced-level task inventories) in Section 1.4 are the bases from which the other sections of the guide were developed: the general job description, the recommended methodology for creating learning activity packages, and the strategies and diagnostic tools available for placing students in the training program.

The methodology used in developing the teaching guide has several important implications for curriculum development efforts. First is the close link established between curriculum intent and instructional practice. If the recommended procedures for developing learning activity packages are followed, the relevance of the instructional content is guaranteed since the occupational analysis produced only the essential, as opposed to the "nice-to-know," tasks and objectives required for acceptable job performance. No matter which tasks and objectives the instructor selects from the inventories, the resulting curriculum content relates to the capabilities derived from the occupational analysis.

Second, since the analysis produced many more tasks than a two-year curriculum could logically utilize, the final set of instructional units is determined at the local level by the instructor, who is in the best position to make such decisions. The instructor's selection of tasks and objectives from the entry-level inventory is made on the basis of identified local employment opportunities, students' needs, and available resources. Consequently, the teaching guide represents a flexible set of materials that can be revised and updated in response to the changing requirements of the career field.

SECTION 1.3

General Job Description: Still Photographic Technician

The General Job Description provides instructors, career guidance counselors, and students with a comprehensive introduction to the career field of still photographic technician occupations. The information contained in this section* includes an overview of the career field, specific descriptions of the type of work done by the still photographic technician, places of employment, training requirements, employment forecasts, expected earnings, working conditions, and sources of additional career information.

NATURE OF THE WORK

Professional and amateur photographers, industries, hospitals, police and fire departments, publishers, and scientists are just a few of the many people and organizations that require the skills of photographic laboratory employees. These workers develop film, make prints and slides, and perform related tasks, such as enlarging and retouching photographs.

All-round darkroom technicians (D.O.T. 976.381) can perform all tasks necessary to develop and print film. The technician varies the developing process according to the type of film—black-and-white negative, color negative, or color positive. For example, a developing process for black-and-white negative film covers five steps: developer, stop bath, fixing bath, washing, and drying. The first three steps use chemical solutions and are performed in darkness. After unwinding a roll of film, the technician places it in the developer, a solution that brings out the image on exposed film. After the film has remained in the developer for a specified period, the technician transfers it to a stop bath to prevent over-development. Next, the film is placed in a fixing bath that makes it insensitive to light, thus preventing further exposure. Finally, the technician washes the film with water to remove the fixing solution and places the film in a drying cabinet. In many photographic labs, technicians regulate machines that automatically perform the steps described above.

Processes for developing color films are more complex than those used for black-and-white. Thus, some labs employ **color technicians** (D.O.T. 976.381)—highly skilled workers who specialize in processing color film.

The still photographic technician makes a photograph by transferring the image from a negative to photographic paper. Printing frequently is performed on a projection printer, which consists of a fixture for holding negatives and photographic paper, an electric lamp, and a magnifying lens. The technician places the negative between the lamp and lens, and the paper below the lens. When he/she turns on the lamp, light passes through the negative and lens and records a magnified image of the negative on the paper. During printing, the still photographic technician may vary the contrast of the image or remove unwanted background by using his/her hand or paper patterns to shade part of the photographic paper from the projected image. After removing the exposed photographic paper from the printer, the technician develops it in much the same way as the negative. If the customer desires, the technician mounts the finished print in a frame or on a paper or cardboard back.

In addition to working in the laboratory, still photographic technicians may set up lights and cameras or otherwise assist experienced photographers. Many technicians, particularly those in portrait studios, divide their time between taking and processing pictures. In some labs, helpers assist technicians. They also may be assisted by workers who specialize in a particular activity, such as **developers** (D.O.T. 976.381),

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*This section has been excerpted from the Occupational Outlook Handbook (1974-75 Edition), U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 1785.

printers (D.O.T. 976.381), and **retouchers** (D.O.T. 970.281).

In most large photo labs, still photographic technicians supervise semiskilled workers who perform specialized assignments that require only a limited knowledge of developing and printing. Included are **film numberers** (D.O.T. 976.887), who sort film according to the type of processing needed and number each roll for identification; **film strippers,** who unwind rolls of film and place them in developing machines; **printer operators** (D.O.T. 976.782), who operate machines that expose rolls of photographic paper to negatives; **machine print developers** (D.O.T. 976.885), who operate machines that develop these rolls of exposed photographic paper; **chemical mixers** (D.O.T. 976.884), who measure and combine the various chemicals that make up developing solutions; **slide mounters,** who operate machines that cut, insert, and seal film in cardboard mounts; and **photocheckers** and **assemblers** (D.O.T. 976.687), who inspect the finished slides and prints and package them for customers.

PLACES OF EMPLOYMENT

In 1972, about 38,000 persons worked in photo lab occupations. More than half of them were in semiskilled photofinishing occupations; the remainder were darkroom technicians.

Most semiskilled workers are employed by large commercial labs that specialize in processing film for amateur photographers. A large proportion of technicians work in photo labs operated by portrait and commercial studios and by manufacturers, newspaper and magazine publishers, advertising agencies, and other organizations. Still photographic technicians also work in commercial labs that specialize in processing the work of professional photographers.

Photo lab jobs can be found throughout the country, but employment is concentrated in the more populous cities and states.

TRAINING, OTHER QUALIFICATIONS, AND ADVANCEMENT

Most still photographic technicians learn their skills through informal on-the-job training. Beginners start as helpers, and gradually learn to develop and print film by assisting experienced technicians. It generally takes three to four years to become a fully qualified still photographic technician. Some helpers become specialists in a particular activity, such as printing or developing. Generally, the training time required in order to become a specialist is less than is needed to become an all-round darkroom technician.

When hiring technician helpers, employers prefer applicants who have high school educations. Courses in chemistry and mathematics are helpful to young people interested in this trade. Some high schools and trade schools offer courses in photography that include training in film processing. The Armed Forces also offer training for still photographic technicians. Experience gained through processing film as a hobby is helpful.

Two-year curricula leading to an associate degree in photographic technology are offered by a few colleges. Completion of college-level courses in this field is helpful to people who are interested in supervisory and managerial jobs in photo labs.

Many still photographic technicians eventually become professional photographers. (See the job description for photographer in the Occupational Outlook Handbook.) Others advance to supervisory positions in laboratories.

Training requirements for workers in semiskilled photo occupations range from a few weeks to several months of on-the-job training. For example, film numberers and slide mounters usually can learn their jobs in less than a month, but printer operators and chemical mixers need several months or longer. For many semiskilled jobs, manual dexterity, good vision including normal color perception, and good hand-eye coordination are important qualifications. However, some laboratories employ blind workers as film numberers and film strippers, since these jobs are performed in the dark to prevent damage to exposed film. Completion of high school generally is not required for semiskilled jobs, but frequently is needed for advancement to supervisory jobs.

EMPLOYMENT OUTLOOK

Employment in still photographic technician occupations is expected to increase rapidly through the mid-1980's. In addition to jobs resulting from employment growth, many openings will result from the need to replace experienced workers who retire, die, or transfer to other fields of work.

The need for semiskilled workers is tied closely to the growth of amateur photography. Film purchases by amateur photographers are expected to increase very rapidly as a result of rising population and personal income, more leisure time, and increased travel. Improvements in still and movie cameras that make them easier to load and operate also should contribute to increases in the use of film. However, the use of mechanized film processing equipment will increase the efficiency of technicians, and will keep employment from growing as fast as the amount of film processed.

The need for still photographic technicians is expected to increase as a result of the growing demand for photography in business and government. A major factor contributing to this demand will be the increasing variety of printed matter that is illustrated with photographs. The growing use of photography in research and development activities also will contribute to the demand for technicians.

EARNINGS AND WORKING CONDITIONS

Earnings of still photographic technicians vary greatly and depend on factors such as skill level, experience, and geographic location. Beginning pay for inexperienced technicians' helpers ranged from $2.25 to $3.50 an hour in 1972, according to the limited information available. Most of the experienced technicians earned between $3.00 and $5.50 an hour. Workers in semiskilled occupations earned from $2.25 to $3.75 an hour. Among these workers, printer operators and chemical mixers generally had the highest earnings.

Many photo labs provide paid holidays, vacations, and other benefits, such as health and life insurance. Workers in labs operated by business and government organizations receive the same fringe benefits as their fellow employees.

The majority of photo lab employees have a 40-hour workweek and get premium pay for overtime. In labs that specialize in processing film for amateur photographers, employees may work a considerable amount of overtime during the summer and for several weeks after Christmas. Many labs employ additional workers temporarily during these seasonal peaks.

Photo lab jobs are not physically strenuous. In many semiskilled occupations, workers perform their jobs while sitting, but the work is repetitious and the pace is rapid. Some workers (for example, printer operators and photocheckers and assemblers) are subject to eye fatigue. Photofinishing labs are generally clean, well-lighted, and air-conditioned.

SOURCES OF ADDITIONAL INFORMATION

Information about employment opportunities in this career field can be obtained from the sources listed in Section 1.7, "Teaching-Learning Resources for the Instructor." A variety of federal agencies have assigned job designation codes to the position of still photographic technician. These codes are commonly used by federal, state, and local governments. When requesting career information, it may be helpful to use these code numbers.

U.S. Civil Service Designation: GS-1060
U.S. Department of Labor (D.O.T.) Designations: 970.281, 976.381, .687 through .887
Standard Industrial Classification Manual Designations: 7333, 7395
Office of Education Code: 17.0900, 17.0901

SECTION 1.4

Inventory of Job Tasks and Learning Objectives

This section presents the job task and learning objective inventories for still photographic technicians at the entry level and task inventories at the intermediate and advanced levels. The tasks and learning objectives at the entry level represent the significant learner outcomes of the training program and are the core materials upon which curriculum and instructional development can be based. The task inventories at the intermediate and advanced levels suggest the career mobility within the field and the increasing difficulty and responsibility involved as one progresses up the career ladder.

Preceding each inventory is a brief overview of the title job for the entry level (still photographic technician aide), intermediate level (still photographic technician), and advanced level (photographic laboratory manager). The letter codes used are: E = entry level, I = intermediate level, and A = advanced level. At the entry level the letter and number codes preceding each job task statement and its learning objective suggest a recommended instructional sequence. Depending upon local resources and facilities this sequence may be modified or expanded. (See Section 1.5, "How to Develop Learning Activity Packages," for procedures for using the task-objective inventory at the entry level).

Section 2.3 provides a qualifications profile of the knowledge, aptitudes, interests, and temperaments required to perform these tasks successfully at the entry level. Sections 2.3 and 2.5 of this guide and the Dictionary of Occupational Titles provide additional information about and detailed explanations of these worker traits.

ENTRY-LEVEL JOB TITLE: STILL PHOTOGRAPHIC TECHNICIAN AIDE

Job duties at the entry level are varied, limited in scope, and short-range. They are designed to train the worker in the basic knowledge and skills needed to operate and maintain photographic equipment. The entry-level worker also learns the standard procedures and policies of the photographic laboratory. When first employed, the entry-level worker assists more highly skilled workers and performs routine, specialized tasks as directed by his or her immediate supervisor. The worker may be rotated from job to job so that experience can be gained in all of the skills needed by the still photographic technician aide. After basic skills have been demonstrated, the entry-level worker works from oral instructions, technical manuals, and laboratory procedure specifications.

The technician aide operates many types of photographic laboratory equipment including: contact and projection printers; film-processing machines; film and print dryers; dry-mounting presses; chemical-mixing devices; diffusion-process equipment; and photographic reproduction equipment. He or she uses this equipment to process all types of film; to copy graphics and prints; and to make duplicates, transparencies, contact prints, and projection prints.

The worker also must have extensive knowledge of the preparation and use of photographic chemicals and a firm grounding in the procedures and technical information-recording systems used in the photographic laboratory. After gaining experience in these duties, the still photographic technician aide may assist photographers in photographic assignments; select and check cameras, films, filters, lighting equipment, and other photographic accessories; and use this equipment to photograph a variety of subjects.

FUNDAMENTALS OF PHOTOGRAPHY

Training Procedures and Course Requirements

Teaching Suggestions: Discuss the course content and requirements. Give a brief overview of the job duties of the still photographic technician aide. Emphasize the standard operating procedures and safety requirements of the photographic laboratory.

	Task	Objective
E-1	Identify training policies and procedures for the still photographic technician course.	Given a training program manual, the student will be able to identify the major training program policies and procedures.
E-2	Identify the blocks and units of course instruction.	Given a training program manual, the student will be able to identify the blocks and units of instruction for the still photographic technician aide training program.
E-3	Identify the major duties and responsibilities of the still photographic technician.	Given a training program manual and a general job description, the student will be able to identify the major duties and responsibilities of the still photographic technician aide.
E-4	Utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards.	Given laboratory facilities and equipment, the student will be able to utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards.

Camera Operation and Maintenance

Teaching Suggestions: Demonstrate the operation of the camera, tripod, adapter, light meter, and neutral gray card. Explain the function of the camera, shutter, focusing mechanism, and operator maintenance procedures. Stress the safety precautions needed when using expensive equipment.

	Task	Objective
E-5	Expose and process film.	Given a camera, tripod, adapter, film, and laboratory facilities, the student will be able to expose and process the film to confirm proper operation of the camera.
E-6	Expose and process film using light meter.	Given a camera, light meter, tripod, adapter, neutral gray card, film, and laboratory facilities, the student will be able to expose and process the film to confirm proper operation of the light meter.

Manual Processing and Finishing Black-and-White Film

Teaching Suggestions: Demonstrate the procedures for exposing, processing, and finishing film. Discuss time, temperature, agitation, solutions, processing methods, and finishing methods. Review handling precautions for films and chemical safety procedures. Remind students to retain all film separators for filing job negatives.

	Task	Objective
E-7	Expose, process, and finish black-and-white film by tank method.	Given a camera, film, developing tank, light meter, gray card, cut film holders, and laboratory facilities, the student will be able to expose, process by the tank method, and finish a roll of black-and-white film. Finished negatives must be free of stains, abrasions, water spots, scratches, pinholes, and fingerprints.
E-8	Expose, process, and finish black-and-white film by tray method.	Given a camera, film, developing tray, light meter, gray card, cut film holders, and laboratory facilities, the student will be able to expose, process by the tray method, and finish a roll of black-and-white film. Finished negatives must be free of stains, abrasions, water spots, scratches, pinholes, and fingerprints.

LABORATORY ADMINISTRATION AND PRODUCTION

Photographic Laboratory Procedures

Teaching Suggestions: Discuss the various forms, technical papers, and manuals used in the photographic laboratory. Stress the need for accurate and complete identification of negatives for filing.

	Task	Objective
E-9	Locate operating instructions for photographic equipment.	Given technical file material, the student will be able to locate the operating instructions for given pieces of photographic equipment.
E-10	Identify and letter negatives.	Given a set of negatives, lettering kit, and accessories, the student will be able to accurately identify and letter the negatives.
E-11	Use laboratory forms.	Given a set of laboratory forms, the student will be able to match the form to its function and accurately fill it out.

Manual Contact Printing and Print Finishing

Teaching Suggestions: Review the mechanical, electrical, and chemical safety precautions for printers, washers, dryers, and trimmers. Demonstrate the use of each piece of equipment and emphasize standard procedures for working with negatives and prints.

	Task	Objective
E-12	Produce contact prints.	Given a contact printer, laboratory facilities, and negatives, the student will be able to produce contact prints of the proper exposure. Finished contact prints must have straight borders, optimum tone, and contrast.
E-13	Produce prints on graded or variable-contrast paper.	Given a contact printer, laboratory facilities, and negatives, the student will be able to produce prints on graded or variable-contrast paper with straight borders, optimum tone, and contrast.

Manual Projection Printing

Teaching Suggestions: Discuss and demonstrate the installation of condensers, lenses, carriers, and negatives. Explain the use of static master brushes, test strips, dodging techniques, cropping methods, easel positioning, and advantages of the critical aperture. Show methods of distortion control and format determination.

	Task	Objective
E-14	Produce acceptable prints from 4x5 negatives.	Given a projection printer, laboratory facilities, and 4x5 negatives, the student will be able to produce acceptable 5x7 prints.
E-15	Produce acceptable prints from 120-size negatives.	Given a projection printer, laboratory facilities, and 120-size negatives, the student will be able to produce acceptable 5x7 prints.
E-16	Produce acceptable prints from 35mm negatives.	Given a projection printer, laboratory facilities, and 35mm negatives, the student will be able to produce acceptable 5x7 prints.

Semi-Automatic Print Processors

Teaching Suggestions: Demonstrate and discuss the controls and operation of the Ektamatic print processor (or similar equipment). Itemize the mechanical and electrical precautions for machine operation. Emphasize the need for recognizing and correcting printing and processing errors.

	Task	Objective
E-17	Expose and process prints with a semi-automatic print processor.	Given an Ektamatic print processor (or similar equipment), projection printer, and laboratory facilities, the student will be able to expose and process 5x7 black-and-white prints of acceptable density and contrast. Finished prints must be free of processing defects.

Toning, Spotting, and Mounting

Teaching Suggestions: Emphasize that toning and spotting prints enhances print quality and that mounting protects and preserves prints. Demonstrate the procedures for toning, spotting, and mounting, and stress the need for safety when working with sharp tools and heat-producing equipment.

	Task	Objective
E-18	Tone prints.	Given toning materials and equipment and selected prints, the student will be able to tone the prints to an acceptable level.
E-19	Spot prints.	Given a retouching kit and defective prints, the student will be able to spot the prints to an acceptable level.
E-20	Mount prints.	Given dry-mounting materials and equipment, finished prints, and matte board, the student will be able to securely dry-mount the prints proportionately centered on the board.

Roll-Film Camera Operation

Teaching Suggestions: Demonstrate all controls and operation of the Graflex x1 KE-46 camera system (or similar system) and review safety practices. Stress the need for maintaining accurate job data.

	Task	Objective
E-21	Photograph close-ups, medium range, and distant views of the same subject with a roll-film camera.	Given a roll-film camera system, tripod, exposure meter and film, the student will be able to photograph a combination of close-ups, medium range, and distant views of the same subject.

CHEMICAL CONTROL

Chemistry for Black-and-White Emulsions

Teaching Suggestions: Explain the function of each type of chemical solution. Stress the caution and safety procedures for using and handling all types of photographic laboratory chemicals.

	Task	Objective
E-22	Prepare and store developer.	Given bulk chemicals, selected formulas, measuring and mixing equipment, accessories, and laboratory equipment, the student will be able to prepare and store designated developer.
E-23	Expose and process prints to confirm chemical solution performance.	Given laboratory facilities and individually prepared processing solution, the student will be able to expose and process prints of selected negatives to confirm chemical solution performance. Properly exposed prints must be free of stains, streaks, and fingerprints.
E-24	Construct control charts.	Given simulated data, graph paper, and required tools, the student will be able to construct properly labeled, plotted control charts within .10 of the instructor's chart.

PHOTOGRAPHIC COPYING AND REPRODUCTION

Equipment, Lenses, and Copy Filters

Teaching Suggestions: Discuss, demonstrate, and evaluate the operation of and safety procedures for copy and view camera equipment.

	Task	Objective
E-25	Identify the proper use of copy equipment.	Given a list of copy equipment, the student will be able to identify the use of each piece of equipment, including copy cameras, lenses, illumination equipment, and filters.
E-26	Determine the effect of a filter on various colors.	Given a 4x5 view camera, copy accessories, film, and laboratory facilities, the student will be able to expose and process the negatives of an assigned subject and determine the effect of a filter on various colors. Finished negatives must have properly exposed images and have no processing defects.

Line Drawings and Blueprints

Teaching Suggestions: Review and discuss the selection of emulsion for the assigned media to copy and filter corrections. Also discuss high contrast developers, reduction and enlargement ratio, and scale.

	Task	Objective
E-27	Expose and process negatives to specified ratio or scale.	Given an original blueprint, copy camera system, accessories, and laboratory facilities, the student will be able to expose and process negatives to the specified ratio or scale. Finished negatives must show well-defined lines and be free of processing defects.

Continuous-Tone and Corrective Techniques

Teaching Suggestions: Review film-filter selection to accomplish reproduction of assigned media. Discuss ratio and scale related to photographic copies. Stress the need for accurate exposure and meticulous processing.

	Task	Objective
E-28	Copy the subject and correct the defect in a continuous-tone print.	Given a soiled, stained, or faded black-and-white, continuous-tone print, copy camera system, accessories, and laboratory facilities, the student will be able to copy the subject and correct the defect. Finished negatives must have acceptable tone and density for quality printing.
E-29	Copy the subject to a specified ratio.	Given black-and-white, continuous-tone and color photographs, copy camera system, accessories, and laboratory facilities, the student will be able to copy the subject to a specified ratio. Finished negatives must have acceptable tone and be free of defects.

Etch, Spot, Block, and Print Copy Negatives

Teaching Suggestions: Discuss the skill, purpose, and limitations of retouching techniques. Demonstrate etch, spot, and block procedures for line negatives.

	Task	Objective
E-30	Etch, spot, and block copy negatives.	Given a retouching kit, light-viewing table, and defective copy negatives, the student will be able to etch, spot, and block the negatives.

E-31	Expose and process prints to correct defects.	Given copy negatives which have been etched, spotted, or blocked and laboratory facilities, the student will be able to expose and process prints to correct the defects in the original subjects.

Specialized Copy Equipment and Procedures

Teaching Suggestions: Demonstrate the operation of specialized copy equipment, such as the MP-3 copy camera and the Repronar 805 slide copier. Discuss the cost factors and end products of duplicating machines used for specialized applications.

	Task	**Objective**
E-32	Expose and process film.	Given a specialized copy camera system, accessories, original subject, and laboratory facilities, the student will be able to expose and process the film with a well-defined and composed image of the original subject.
E-33	Expose and process black-and-white film from color slides or black-and-white negatives.	Given a specialized slide copier, accessories, black-and-white 35mm film, and laboratory facilities, the student will be able to expose and process the film from designated color slides or black-and-white negatives. Finished negatives and positives must show proper use of cropping techniques, exposure and contrast, and be free of processing defects.

OPTICS, CAMERA SYSTEMS, AND FILTERS

Principles and Applications of Optics in Photography

Teaching Suggestions: Emphasize the importance of photographic principles and their applications in successful photography. Stress the need for accurate recording of results when learning these principles. Demonstrate procedures and stress precautions for interchanging lenses and handling photographic equipment.

	Task	**Objective**
E-34	Demonstrate knowledge of: depth of field, depth of focus, diaphragm-lens aperture, angle of view, and focal length.	Given a 4x5 view camera, film, accessories, and distance markers, the student will be able to photograph the distance markers using an 8½" FL lens and a 10" FL lens and record the effects of depth of field, depth of focus, diaphragm-lens aperture, angle of view, and focal length.

E-35	Demonstrate knowledge of: image-size control, perspective control, flare control, critical aperture effects, and the 2/5th rule.	Given a Graflex xl (KE-46) camera system, 120-type panchromatic film, and accessories, the student will be able to photograph examples, using three different lenses, which show image-size control, perspective control, flare control, critical aperture effects, and the 2/5th rule.

Reflex Camera Operation

Teaching Suggestions: Emphasize the need for complete familiarization with photographic equipment and accessories during the performance of photographic assignments. Stress safety practices and standardized procedures during demonstration of small camera operation.

	Task	**Objective**
E-36	Expose, process, and proof-print selected subjects to illustrate: image size, camera angle, control of scene brightness range, and subject placement.	Given a Rolleiflex camera system, 120 film, and laboratory facilities, the student will be able to expose, machine-process, and proof-print photographs of selected subjects to illustrate: image size, camera angle, control of scene brightness range, and subject placement.
E-37	Expose, process, and proof-print selected subjects to illustrate basic types of acceptable photograph composition.	Given a 35mm Leica camera, light meter, 35mm film, and laboratory facilities, the student will be able to expose, machine-process, and proof-print photographs of selected subjects to illustrate basic types of acceptable photograph composition.
E-38	Expose, process, and proof-print selected subjects to illustrate: haze penetration, pictorial rendition, and tonal contrast.	Given a 35mm Nikon F camera, accessories, infrared roll film, red filter, and laboratory facilities, the student will be able to expose, process, and projection print photographs of selected subjects to illustrate: haze penetration, pictorial rendition, and tonal contrast

Filters for Black-and-White Photography

Teaching Suggestions: Discuss and demonstrate filter factor computation for exposure compensation, benefits, and limitations.

	Task	**Objective**
E-39	Identify purpose and application of specific filter designations.	Given specific filter designations for black-and-white photography, the student will be able to identify the purpose and application of each.

E-40	Expose, process, and proof-print selected subjects through contrast, correction, neutral density, and polarizing filters.	Given a 4x5 camera system and accessories, film, and laboratory facilities, the student will be able to expose, process, and proof-print selected subjects through contrast, correction, neutral density, and polarizing filters.

Creative and Communicative Composition

Teaching Suggestions: Demonstrate view camera controls for creative composition and provide several examples. Discuss the qualities of creative and communicative photographs.

	Task	Objective
E-41	Employ creative and communicative composition techniques.	Given a 4x5 camera system, accessories, film, and laboratory facilities, the student will be able to expose, process, and proof-print selected subjects employing creative and communicative composition techniques.

SPECIALIZED PHOTOGRAPHIC ASSIGNMENTS

Documentary and Industrial Record Photographs

Teaching Suggestions: Discuss the types of industrial subjects and the need for documented photographs accompanied by complete, accurate entries in the film log. Demonstrate procedures for painting with light and review safety precautions.

	Task	Objective
E-42	Photograph damaged industrial equipment.	Given a view camera, portable lights, and accessories, the student will be able to photograph damaged industrial equipment.
E-43	Process, contact proof-print, and print photographs of damaged industrial equipment.	Given a roll of exposed film of damaged industrial equipment and laboratory facilities, the student will be able to process, contact proof-print, and print selected photographs with well-defined tone and contrast. Finished prints must show close-up view of damaged area and an overall view of the equipment.

E-44	Photograph and process assigned industrial subjects using painting-with-light technique.	Given a view camera, portable lights, and accessories, the student will be able to photograph and process assigned industrial subjects using painting-with-light technique to record texture and structural detail. Finished negatives must have distortion control, optimum tone, and contrast.
E-45	Produce quality prints of industrial subjects.	Given a projection printer, laboratory supplies and facilities, and three selected negatives of industrial subjects, the student will be able to produce one quality 8x10 print from each negative. Finished prints must include well-defined study of subject, minimum effect of shadows, and controlled background.

Official and Conventional Portraits

Teaching Suggestions: Emphasize that considerable practice and experience is required before mastering the art of portrait photography. Discuss the significance of arranging the lights, picture composition, and proper exposure.

	Task	Objective
E-46	Pose subject, arrange lights, and photograph subject.	Given a view camera, portrait lighting and accessories, the student will be able to pose the subject, arrange the lights, and photograph the subject with 2:1, 3:1, and 4:1 light ratios.
E-47	Process negatives and print photographs of portrait subject.	Given a roll of exposed film of a portrait subject, the student will be able to process the film and print six finished photographs of the subject. Background control, posed expression, and illumination must be complementary to the subject.
E-48	Make portrait photographs using broad, short, and butterfly lighting techniques.	Given a view camera, portrait lighting and accessories, laboratory facilities, and Polaroid and pan film, the student will be able to produce six finished photographs using broad, short, and butterfly lighting techniques.

Identification and Passport Photographs

Teaching Suggestions: Review the need for speed and standardization when taking identification photographs. Itemize the specifications and options for passport photographs.

	Task	Objective
E-49	Make front-view, white-background identification and passport photographs.	Given a portrait camera, studio lights, and Polaroid film, the student will be able to make acceptable front-view, white-background identification and passport photographs.
E-50	Make projection prints of identification and passport photographs and dry-mount them for display.	Given two high-quality negatives of identification and passport portraits, the student will be able to make 5x7 or 8x10 projection prints and dry-mount them for display.

Sports and Action Photography

Teaching Suggestions: Emphasize the significance of a detailed equipment check, itemized planning outline, alert performance, and concern for maintaining good public relations.

	Task	Objective
E-51	Photograph a sports or action sequence.	Given a 120-size roll-film camera, electronic flash, and one roll of pan film, the student will be able to photograph a sports or action sequence. A minimum of five photographs must demonstrate proper techniques of action photography.

COLOR PHOTOGRAPHY

Theory of Color and Light

Teaching Suggestions: Demonstrate the construction of a color star, additive and subtractive color processes, and the effects of filters on white light.

	Task	Objective
E-52	List the additive primary colors and their complementary subtractive primaries.	Given a blank color star, the student will be able to list the additive primary colors and their complementary subtractive primaries.
E-53	List the colors formed by the additive and subtractive color process.	Given an illustration of the additive and subtractive color systems, the student will be able to list the colors formed by the additive and subtractive color process.
E-54	Identify the effects of filters on white light.	Given a drawing of various filters, the student will be able to identify their effects on white light by listing the colors transmitted and absorbed.

Color Film Emulsions

Teaching Suggestions: Discuss the construction, characteristics, and processing effects of negative, reversal, and infrared color films. Demonstrate the construction of negative, reversal, and infrared color films, showing how exposure to the additive and subtractive primary colors affects each type of film and showing where dyes are formed.

	Task	Objective
E-55	Identify where exposure occurs and dyes are formed on reversal color film.	Given a cross-sectional drawing of reversal color film, the student will be able to identify where exposure occurs and dyes are formed when exposed to the additive and subtractive primary colors and then processed.
E-56	Identify where exposure occurs and dyes are formed on negative color film.	Given a cross-sectional drawing of negative color film, the student will be able to identify where exposure occurs and dyes are formed when exposed to the additive and subtractive primary colors and then processed.
E-57	Identify where exposure occurs and dyes are formed on infrared color film.	Given a cross-sectional drawing of infrared color film, the student will be able to identify where exposure occurs and dyes are formed when exposed to the additive and subtractive primary colors and then processed.

Exposing and Processing Reversal Color Films

Teaching Suggestions: Discuss reversal film lighting, exposure requirements, and camera system operation. Demonstrate exposure calculations and lighting camera system operations. Stress careful handling of equipment.

	Task	Objective
E-58	Mix reversal color chemical solution.	Given reversal color chemicals and laboratory facilities, the student will be able to mix designated chemical solution following manufacturer's instructions and observing safety measures in handling chemicals.
E-59	Expose reversal color film.	Given a 35mm camera and accessories, the student will be able to properly expose one roll of reversal color film.
E-60	Process reversal color film.	Given proper processing equipment and reversal color chemical solution, the student will be able to process one roll of reversal color film.

Duplicating Color Slides

Teaching Suggestions: Demonstrate slide duplicating equipment including controls and adjustments.

	Task	Objective
E-61	Duplicate and process color slides.	Given 35mm slides, slide duplicating equipment, and laboratory facilities, the student will be able to duplicate and process 12 color slides.
E-62	Mount color slides.	Given 12 duplicate 35mm color slides, the student will be able to mount the slides so that they are free of defects.

Color Process Control and Monitoring

Teaching Suggestions: Discuss chemical mixing and color process control charts. Demonstrate color mixing and construction of color process control charts.

	Task	Objective
E-63	Mix color chemicals for color films.	Given manufacturer's instruction sheet, the student will be able to mix color chemicals for color films.
E-64	Construct a color process control chart.	Given a process record form, straightedge, red, green and blue pencils, and density values, the student will be able to construct a color process control chart.
E-65	Identify out-of-control strips.	Given a color process control chart, the student will be able to identify out-of-control strips.

Exposing and Processing Negative Color Films

Teaching Suggestions: Discuss negative color films, lighting, and exposure requirements. Show a slide/tape presentation on negative color films. Demonstrate exposure calculations, gray card placement, and lighting.

	Task	Objective
E-66	Expose and process daylight color film.	Given a 4x5 camera system, accessories, and laboratory facilities, the student will be able to expose and process seven sheets of daylight color film. Red density of the gray card must be between 0.75 and 0.95.

E-67	Expose and process negative color film of portraits.	Given a 4x5 camera system, studio lights, and laboratory facilities, the student will be able to expose and process 12 negatives using negative color film. One gray card should be included for every fourth exposure. Red density of gray card must be between 0.75 and 0.95.

Color Printing

Teaching Suggestions: Discuss the effects of filtration and development variations. Discuss and demonstrate negative evaluation systems, corrective methods, and finishing.

	Task	**Objective**
E-68	Expose and process black-and-white prints from color negatives.	Given printing and processing facilities, the student will be able to expose and process on Panalure paper, 10 black-and-white prints with acceptable density and contrast from color negatives.
E-69	Mix and certify color-print chemicals.	Given color-print chemicals, hydrometer, and pH meter, the student will be able to mix and certify chemicals following manufacturer's data sheet. Specific gravity and pH measurements must be within ± .05 of instructor's readings.
E-70	Expose and process color prints from standard negative.	Given Ektacolor RC paper, printing and processing facilities, and a standard negative, the student will be able to produce one properly exposed and processed 4x5 color print. Red, green, and blue-gray card densities must read 0.80 ± 0.04 on a reflectance densitometer.

JOURNALISTIC TECHNIQUES AND PHOTO LAYOUTS

Photojournalism Specifications

Teaching Suggestions: Demonstrate the preparation of a shooting outline. Allow time for students to select a subject and prepare the outline. Stress visual appeal, subject activity, key picture size, and continuity. Emphasize job planning, organization, coordination, interest, reader recognition, etc. Also emphasize accuracy of captions, layout sequence, and overall impact.

	Task	**Objective**
E-71	Prepare a shooting outline.	Given a photographic assignment (personality, small groups, spot news, picture story, etc.), the student will be able to prepare a shooting outline.

E-72	Select equipment and materials.	Given a photographic assignment (personality, small groups, spot news, picture story, etc.), the student will be able to select the appropriate photographic equipment and materials required.
E-73	Expose and process film.	Given a photographic assignment (personality, small groups, spot news, picture story, etc.), the student will be able to expose and process the film.
E-74	Make a contact proof sheet.	Given exposed film and laboratory facilities, the student will be able to make a contact proof sheet.
E-75	Print exposures.	Given laboratory facilities, a contact proof sheet, and negatives, the student will be able to select a predetermined number of exposures, annotate them on the proof sheet, and projection-print them to predetermined layout size and high image quality.
E-76	Mount and sequence prints on mounting board.	Given a series of photographs projection-printed to same column cut-size as indicated in layout, the student will be able to mount prints in proper position and sequence on mounting board.
E-77	Write captions and cutlines.	Given a series of photographs, the student will be able to write captions and cutlines for each photograph to meet editorial standards.

INTERMEDIATE-LEVEL JOB TITLE: STILL PHOTOGRAPHIC TECHNICIAN

At the intermediate level, the still photographic technician performs many of the same tasks performed at the entry level except with greater proficiency, accuracy, and speed. Assignments at this level are varied to broaden training and experience and frequently involve following an operation through a series of related detailed steps or processes. The technician is given more responsibility and independence in planning work sequences, selecting appropriate equipment and materials, and maintaining quality control. The technician keeps his or her supervisor informed of work progress and consults the supervisor when technical problems arise, when it is believed necessary to deviate from established procedures or practices, or when alternative methods need to be considered. Work completed by the technician is reviewed by his or her supervisor for accuracy and quality and adherence to instructions and laboratory policies. In addition to having greater technical proficiency in operating photographic laboratory and camera equipment, the still photographic technician is responsible for selected administrative duties such as ordering parts and supplies, preparing reports, and working with customer orders.

INTERMEDIATE-LEVEL TASKS

Administrative Tasks

I-1 Arrange for equipment repair or replacement.

I-2 Balance and maintain ledgers.

I-3 Compute billings for work done for other organizations.

I-4 Conduct general safety inspections of equipment spaces.

I-5 Draft messages, correspondence, and instructions.

I-6 Follow up supply requisitions.

I-7 Maintain personnel time sheets.

I-8 Maintain technical reference library.

I-9 Make open purchases.

I-10 Order parts and supplies.

I-11 Prepare and submit reports.

I-12 Screen parts or equipment received from supply source.

I-13 Select job orders.

I-14 Stock and issue parts, supplies, equipment, tools, etc.

I-15 Take inventory of tools, equipment, and supplies.

I-16 Work up specifications for open purchase orders.

Technical Tasks

I-17 Assemble/disassemble still cameras.

I-18 Calibrate densitometer.

I-19 Calibrate exposure meters.

I-20 Calibrate still camera shutters.

I-21 Clean/lubricate electric motors.

I-22 Conduct research of publications and technical manuals for data.

I-23 Construct kits for special presentations (briefings, lectures).

I-24 Install or relocate laboratory equipment.

I-25 Make transparencies from diagrams, schematics, etc.

I-26 Measure voltages on electrical/electronic circuits.

I-27 Modify laboratory equipment.

I-28 Perform continuity checks on electrical/electronic circuitry.

I-29 Perform miniature component repair to electronic circuitry.

I-30 Perform PM checks on laboratory equipment.

I-31 Repair/adjust electronic equipment.

I-32 Repair camera bodies (remove dents, replace leather, etc.).

I-33 Replace broken camera lenses.

I-34 Replace components of still camera shutters.

I-35 Replace mirrors in reflex cameras.

I-36 Replace prism in camera viewfinders.

I-37 Splice electrical cables.

I-38 Take pH readings of chemicals.

I-39 Take samples of chemical solution for analysis.

I-40 Take specific gravity readings of chemicals.

I-41 Test and evaluate photo equipment (cameras, processors, etc.).

Photographic Tasks

I-42 Determine equipment needed on location (cameras, lighting, tripods, etc.).

I-43 Determine type and amount of film required to shoot job.

I-44 Develop a dominant theme for a pictorial story.

I-45 Expose and process film suitable for production of newspaper quality prints.

I-46 Judge photo contests.

I-47 Make a photographic personality study.

I-48 Make editorial photographs.

I-49 Make publicity photographs of people or activities.

I-50 Perform a functional check on photographic equipment and accessories.

I-51 Photograph a news event.

I-52 Photograph a person in his/her work environment.

I-53 Photograph a small group.

I-54 Photograph a sports event.

I-55 Photograph commercial products advertisement (furniture, food, clothes, etc.).

I-56 Photograph educational slide/filmstrip presentation.

I-57 Photograph industrial products.

I-58 Photograph picture story elements according to a script.

I-59 Photograph real estate advertisement.

I-60 Plan a layout for a pictorial narrative.

I-61 Plan an organized sequence of photos, with accompanying text.

I-62 Plan and prepare camera position and compositional elements.

I-63 Plan and prepare for key shots, lead pictures and impact.

I-64 Plan and prepare continuity and logical progression.

I-65 Research a photographic story idea.

I-66 Select and photograph a subject from different angles following basic rules of composition.

I-67 Select film to be used for specific photographic situations.

I-68 Select filter to be used for specific photographic situations.

I-69 Select proper lighting equipment to be used for specific photographic situations.

I-70 Use professional camera systems operation and application procedures.

ADVANCED-LEVEL JOB TITLE: PHOTOGRAPHIC LABORATORY MANAGER

The photographic laboratory manager plans, schedules, and supervises all work done in the laboratory. The manager must have a thorough knowledge of photographic equipment operation and maintenance; photographic materials, supplies, and accessories; and a high level of technical expertise in establishing and maintaining quality-control procedures. As an administrator and planner, the photographic laboratory manager is responsible for controlling job costs, checking laboratory record-keeping systems, and solving problems related to specific job orders. He or she also is responsible for personnel matters pertaining to the employment, training, termination, and grievances of technical personnel.

ADVANCED-LEVEL TASK INVENTORY

Supervisory Tasks

A-1 Assign priorities to jobs.

A-2 Assure effective use of all assigned photographic technician.

A-3 Assure personal safety precautions.

A-4 Assure proper handling of special projects.

A-5 Assure quality of photographic end-products.

A-6 Assure safe handling and use of equipment.

A-7 Conduct job-proficiency evaluations.

A-8 Critique work performed by the still photographic technician.

A-9 Determine on-the-job training needs.

A-10 Establish performance requirements of laboratory personnel.

A-11 Establish and maintain a testing program to determine specific training requirements.

A-12 Inspect work performed by the still photographic technician.

A-13 Monitor progress of routine laboratory functions.

A-14 Orient newly assigned personnel.

A-15 Prepare performance reports on laboratory workers.

Administrative Tasks

A-16 Administer maintenance plan.

A-17 Arrange for adequate space and facilities.

A-18 Assure proper building security.

A-19 Assure that reports and records are completed and submitted according to established procedures.

A-20 Compute break-even point.

A-21 Compute customer and laboratory billings.

A-22 Construct a work distribution chart.

A-23 Determine needs for new equipment and supplies.

A-24 Establish a price catalog for products and services.

A-25 Interview and evaluate job applicants.

A-26 Interview vendors of photographic equipment.

A-27 Maintain an adequate equipment inventory to satisfy the assignment requirements.

A-28 Maintain an adequate level of expendable supplies to support laboratory workload needs.

A-29 Maintain and manage the property of the photographic laboratory.

A-30 Maintain files and records.

A-31 Make a break-even analysis.

A-32 Make direct cost computations.

A-33 Make indirect cost computations.

A-34 Prepare production reports.

Planning Tasks

A-35 Construct a flow-process chart.

A-36 Construct floor plans for new photographic laboratory.

A-37 Develop cost-reduction methods.

A-38 Develop safety policies and procedures.

A-39 Establish a job-priority system for the photographic laboratory.

A-40 Establish a work-count system.

A-41 Establish and maintain a testing program to evaluate photographic proficiency.

A-42 Establish short-interval scheduling procedures.

A-43 Implement a bench-stock system of inventory control.

A-44 Implement lab procedures using work flow improvement, work simplification and motion analysis techniques.

A-45 Plan the photographic laboratory budget.

A-46 Relate technological change to equipment and supply resources.

A-47 Take timely action to secure necessary changes in laboratory procedures.

Technical Tasks

A-48 Analyze and control color processes.

A-49 Analyze the effect of development on the sensitometric parameters.

A-50 Assign all variations in repeatability as to cause/chance variation using the Versamat processor and previously determined replenishment rate.

A-51 Calibrate a given densitometer and read previously exposed and processed sensitometric strips for use in next SW.

A-52 Certify new developer mixes.

A-53 Construct and evaluate time-temperature charts.

A-54 Construct time-gamma and time-fog charts from a family of sensitometric curves.

A-55 Detect any significant change in the exposures produced by a sensitometer.

A-56 Determine exposure latitude and film speed from selected sensitometric curves.

A-57 Determine methods to minimize pollution caused by the discharge of laboratory chemicals.

A-58 Develop procedures for establishing chemical process control.

A-59 Determine sources of error in density measurement.

A-60 Determine the anti-logs of logarithms using the log tables.

A-61 Determine the logarithms of numbers using log tables.

A-62 Develop silver-recovery potential.

A-63 Establish a proposed replenishment rate for the Versamat processor using sensitometric and chemical control techniques.

A-64 Inspect negative and print defects.

A-65 Keep abreast of technical changes in photographic processes.

A-66 Make pH and specific gravity determinations of given processing solutions.

A-67 Plot pH and specific gravity values on a process control chart.

A-68 Plot sensitometric curves from density readings.

A-69 Process previously exposed sensitized material using ANSI processing method with an accuracy of ± 10 seconds processing time.

A-70 Produce controlled exposures using a sensitometer and sensitized material.

A-71 Use densitometer certification procedures.

A-72 Use logarithms to calculate transmission, density, and opacity values.

A-73 Use logarithms to solve designated mathematical problems.

A-74 Use sensitometric and chemical control techniques to certify a Versamat processor.

A-75 Validate Versamat processor repeatability using previously determined replenishment rate.

SECTION 1.5

How to Develop Learning Activity Packages

The development of a performance-based curriculum for still photographic technician aide training is based on a method called functional job analysis (described in Section 1.2). This method of analyzing actual job requirements as defined by employers is an effective way to develop a training curriculum. With this method, a training program curriculum contains the essential skills and knowledge that an entry-level worker performs on the job and leads to the development of an instructional system that describes **what**, **why**, and **how** the trainee is to learn these skills and knowledge.

This section explains how to take the job tasks and learning objectives presented in Section 1.4 and develop units of instruction, or learning activity packages (LAPs), from them. Two sample LAPs—one based on a job task and one based on the skills of approximation and estimation—are included as models that can be used to develop LAPs at the local level.

In addition to the information and sample LAPs presented here, which are specifically related to the still photographic technician aide training program, the instructor should refer to the series of POP (Pre-Service Occupational Program) Kits available from the Illinois Office of Education. The POP Kits cover such instructional planning topics as student performance objectives, domains of learning, writing sets of objectives, lesson planning, unit planning, constructing learning activity packages, and instructional materials.

Section 1.5, when used in conjunction with the POP Kits, provides the tools for building an instructional system based on the tasks, learning objectives, and supplementary materials presented in this guide.

PRINCIPLES OF LEARNING

No matter what the content of a curriculum or the instructional methods used, there are several basic principles of learning that underlie the development of learning activity packages. The two sample LAPs presented later in this section are guided by these principles; it is strongly recommended that the seven principles of learning described below be kept in mind as LAPs are developed for the training program.

Optimum Step Size. Optimum step size involves the application of two concepts. First, students learn best when they are not frustrated by material that is too difficult. Second, students learn best when they are challenged beyond boredom. To apply these concepts, instruction is developed by increments, or steps, that are small enough to permit mastery without frustration but are large enough to provide meaningful challenge. Determining the optimum step size depends on several factors such as student background, intelligence, difficulty of material, and so on.

Controlled Responding. Not only is the instruction presented to the student in predetermined steps, but it also directs him or her to assume an active role by performing specific activities within each step. These activities are determined during the development of the learning activity package. It requires each student to apply what he or she learns as it is learned. This insures that the student progresses toward the learning objective. When controlled responding is built into the learning, the student becomes an active, rather than passive, participant in the learning experience.

Knowledge of Results. After responding overtly to each optimum step of instruction, the student learns whether the response was correct or incorrect. Such knowledge of results, also known as confirmation, serves two purposes. Its primary purpose is to reinforce the learning process. When a student responds correctly and is told so, the learning of correct performance is reinforced and he or she is motivated toward further learning. Its secondary purpose is to correct wrong responses and thus prevent the student from practicing wrong performances. Without such timely knowledge of results, a student can repeat a mistake until it becomes part of his or her performance.

Controlled Pacing. In conventional instruction the training time is usually a constant factor. For example, if it has been decided that a specified amount of time will be spent on a segment of learning, then all students receive the specified amount of time regardless of differences in aptitude. We know from experience, however, that students learn at varying rates; but little provision is ever made for this obvious fact. By using LAPs, on the other hand, instruction time becomes a variable instead of a constant factor. If student self-pacing can be built into the learning situation, each student is allowed to progress at his or her own rate according to learning ability. If self-pacing is working effectively, the faster student is not held back and the slower student is not forced to rush in order to keep up. Controlled pacing confirms the learning activity package as the method that most practically achieves a balance between the needs of teaching and the requirements of learning. If individually paced learning is not practicable, then a group-paced approach can be used. In this approach, students are organized into homogeneous pacing groups so that each group can proceed at the appropriate learning rate.

Validation. Validation is the process of determining the effectiveness of instruction. It places the burden of teaching upon the system; if the students fail to achieve the objective of the learning activity package, one should assume that the instruction has failed. When such failure occurs, the instruction should be revised and restructured until the students achieve the learning objective.

Student-Centered Approach. The student-centered approach is one that incorporates all the previous principles in a comprehensive learning system. The final outcome of instruction is focused on student performance and measuring that performance. Learning is student-centered when the student has been taught through optimum steps, has been directed to respond, has been provided with knowledge of results, has progressed at his or her own rate, or within a rate appropriate to a particular homogeneous group, and when a careful analysis of the student's performance has been conducted.

Performance Analysis. The final product of a performance analysis includes: a complete, precise listing of the skills and knowledge that must be taught in order to prepare the student to master the objective; a determination of the conditions under which the student will perform; and the factors which constitute acceptable performance by the student. Performance analysis consists of a review of all performance objectives, field surveys, task observations, and any other process which yields empirical data about the actual performance the student is expected to demonstrate at the conclusion of a learning activity package. The analysis should involve only those skills and knowledge that are critical to performance of the task or achieving the objective. It should omit any material that is "nice-to-know," but not critical.

LEARNING ACTIVITY PACKAGES

The successful learning activity package is based on the comprehension, by the instructor and the student, of these four terms: objective, overview, learning experience, and summary.

The **objective** is the end result toward which student effort is directed in the package. It is stated in performance terms, which means that the student must demonstrate achievement of the performance specified. The objective states what the student should have learned at the completion of the LAP. The overview explains why it is important to achieve the stated objective and how it can benefit the student. The

learning experience guides the student through a step-by-step process to achieve the objective. The **summary** reviews the reason for doing the particular activity and reinforces the learning that has occurred during the LAP.

The key point of a learning activity package is, of course, the LAP's objective. The objective determines both the content and the activities of the LAP. The other components of the LAP, particularly the learning experiences, should support and satisfy the learning objective. Upon completion of the activities prescribed by the learning experiences, the student should be able to demonstrate the capability stated in the objective.

The learning experiences within the LAP should reflect the student capabilities necessary to satisfy the LAP's objective. The number of experiences and their content may vary from LAP to LAP. In fact, a given capability can, and should, be attained through different kinds of learning experiences. The instructor should be able to use various types of instructional methods (see Section 1.6) in order to provide students with appropriate learning experiences that will lead to mastery of the LAP objective.

In order to provide the student with first-hand exposure to vocational capabilities, emphasis must be placed on performance-based learning experiences—i.e., LAPs based on the tasks presented in Section 1.4. Performance-based activities permit the student to utilize both cognitive and psychomotor processes in achieving the objectives of a learning activity package. They also provide the instructor and student with the opportunity to evaluate the attainment of vocational capabilities.

Non-performance activities, to be sure, have their value; but these activities alone cannot provide the student with the capabilities which he or she will need on the job in the working world. In addition, many students are at relatively low reading and vocabulary levels; this casts doubt on how much the student really learns through these methods. There is also a question if portions of theories, principles, or concepts are really needed by the student to achieve given capabilities at a particular level or if they are needed at all. Determining how much theory and how much practice is to be included in a learning activity package is sometimes a difficult process. Very often, however, a clear statement of the LAP's objective will provide the answer.

Another factor to be considered in developing LAPs involves the selection of appropriate reference materials and teaching-learning aids. This requires a consideration of a number of factors, such as the relevance of the information, the ability of the student to benefit from it, and its availability, cost, and ease of use. These must be evaluated continually since the criteria for their selection may change from LAP to LAP. Section 1.7 lists reference materials and teaching aids which the instructor should find useful in developing learning activity packages.

DEVELOPING LAPS FROM A TASK

In Section 1.1 of the guide a series of steps were presented in order to specify the content of the training program. The result of this process was a sequenced list of performance-based tasks and their associated learning objectives. The steps below show one way to identify the skills, knowledge, and activities related to each task that can be used to develop one or more learning activity packages.

To help you work through these steps, three worksheets are provided on the following pages. (Blank worksheets are included at the end of this section for duplication and use by the instructor.) Steps 1-6 explain Worksheets 1 and 2 and help you to gather and organize the information needed to develop a LAP. Worksheet 1, "Task Listing," involves selecting a task for instruction and identifying other tasks that are related to the selected task. Worksheet 2, "Task Analysis," is used for breaking down a task into the skills and knowledges required to perform the task. Steps 7-11 explain Worksheet 3, "LAP Outline," which is used for organizing the information developed on Worksheets 1 and 2 into a learning activity package outline.

STEP 1: Select a task for instruction.

From your list of sequenced tasks, select one task for instruction. Write this task down in the space provided on Worksheet 1. For the sample LAP presented in this section, the following task was selected: "Utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards."

STEP 2: Identify tasks that are closely related to the task selected in Step 1.

Although you are working with only one task at a time, it is important to identify those tasks that are closely related to the task you selected. By completing this step, you will establish interrelationships among a group of tasks. Write down these tasks in the spaces provided on Worksheet 1. Examine these tasks and how they are related to one another. This helps to establish a sequence for other learning activity packages that you will develop.

STEP 3: Specify the learning conditions and outcomes of the task to be performed by the student.

Moving on to Worksheet 2, write down the task, the learning conditions under which the task will be performed by the student, and the outcomes which will be used to evaluate student performance. For the sample LAP, the learning conditions are: "Simulation of actual safety precautions." The criterion for judging student performance is: "The student will utilize safety precautions at all times."

STEP 4: Break down the task into learning activities.

The task you have selected should now be broken down into more manageable components—learning activities. For the selected task these activities have been listed in the spaces provided on Worksheet 2:

1. Observe safety precautions related to fire hazards.
2. Observe safety precautions related to chemical hazards.
3. Observe safety precautions related to electrical hazards.
4. Observe safety precautions related to machine operation.

STEP 5: Break down each activity into specific steps.

On Worksheet 2 each learning activity has been broken down into a series of steps. For example, under the activity of "Observe safety precautions related to fire hazards," five steps have been listed:

Step 1. Maintain clean working areas.
Step 2. Avoid concentrations of flammable or explosive gases and vapors.
Step 3. Determine location of extinguishers.
Step 4. Know the type of extinguisher needed for different types of fires.
Step 5. Know how to use various types of extinguishers.

For each of the other three learning activities specified above, a similar sequenced list of steps has been generated on Worksheet 2.

STEP 6: Identify the knowledges which support the performance of each activity.

The final component of Worksheet 2 is a listing of the knowledges which support the performance of the steps under each learning activity. For example, in observing safety precautions related to fire hazards it is important for the still photographic technician aide to understand the four general classes of fire and their related extinguishing agents. The supporting knowledges for each activity are listed below the series of steps identified on Worksheet 2.

Steps 1-6 above have helped you to gather and organize the information needed for the development of LAPs related to a single task statement: "Utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards." All of this information has been entered on Worksheets 1 and 2. Steps 7-11 explain how to take the information from Worksheets 1 and 2 and develop an outline for a single learning activity package.

STEP 7: Select one learning activity from Worksheet 2 as the content for a single LAP.

In the sample provided in this section, the learning activity "Observe safety precautions related to fire hazards" has been selected as the content for a learning activity package. The other three learning activities identified can be used for the development of subsequent LAPs. The intent of selecting just one learning activity is to narrow the focus of instruction into manageable units. Enter the activity name and the steps into which it has been broken down in the spaces provided on Worksheet 3.

STEP 8: Write the objective for the LAP.

On Worksheet 2 the learning conditions and the performance criteria were identified for the task statement as a whole. Using this information as a foundation, write the LAP objective as it pertains to the specific learning activity you selected. Remember that the objective is a statement of what the student will be able to do at the completion of the LAP. On Worksheet 3 the objective of the sample LAP has been stated as: "In a series of simulated activities, the student will be able to demonstrate knowledge of the four general classes of fire."

STEP 9: Write an overview to the LAP.

The overview provides a general introduction to the LAP, explains the importance of the LAP's objective, and how it can benefit the student. It also serves as a link to other kinds of tasks that have already been taught or will be taught in subsequent LAPs (see Worksheet 1). Writing the overview is an important step in LAP development, because it requires the instructor to focus his or her attention on what is to be learned during this particular LAP. Review the sample overview on Worksheet 3 to see how this is accomplished.

STEP 10: List learning experiences for the LAP.

Learning experiences should take into account all of the steps listed at the top of Worksheet 3. In preparing a LAP outline, list the learning experiences that are needed to deal with each step and that will accomplish the objective. For the sample unit these are listed in the space provided under "Learning Experiences."

STEP 11: Write a summary of the LAP.

The summary provides a review of the outcome of the learning experiences in order to reinforce the learning that has taken place during the LAP. Space is provided on Worksheet 3 to write this summary.

Worksheet 1

TASK LISTING

Job: Still Photographic Technician Aide

Task: Utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards.

Related Tasks:

1. Expose, process, and finish black-and-white film by tank method.
2. Expose and process prints with a semi-automatic print processor.
3. Prepare and store developer.
4. Expose and process prints to confirm chemical solution performance.
5. Identify the proper use of copy equipment.
6. Mix reversal color chemical solution.
7. Mix color chemicals for color films.
8. Mix and certify color-print chemicals.
9. Select equipment and materials.
10. Photograph a sports or action sequence.

Worksheet 2

TASK ANALYSIS

Job: Still Photographic Technician Aide

Task: Utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards.

Learning Conditions: Simulation of actual safety precautions.

Outcome: The student will utilize safety precautions at all times.

Learning Activity: Observe safety precautions related to fire hazards.

Steps:

1. Maintain clean working areas.
2. Avoid concentrations of flammable or explosive gases and vapors.
3. Determine location of extinguishers.
4. Know the type of extinguisher needed for different types of fires.
5. Know how to use various types of extinguishers.

Supporting Knowledge Required: Understand the four general classes of fire and their related extinguishing agents.

Worksheet 2 – Continued

TASK ANALYSIS

Learning Activity: Observe safety precautions related to chemical hazards.

Steps:

1. Adhere to manufacturer's recommendations for mixing and using chemicals.
2. Insure that laboratory has adequate ventilation.
3. Never sniff a container to determine its contents.
4. Use proper protective equipment and clothing when necessary.
5. Use a respirator when mixing chemicals in powder form.
6. Always add acid to water, never the reverse.
7. Always use cold water when diluting sodium hydroxide.
8. Store solutions in properly labeled containers.

Supporting Knowledge Required: Knowledge of basic properties and reactions of chemicals used in photography.

TASK ANALYSIS

Learning Activity: Observe safety precautions related to electrical hazards.

Steps:

1. Check power cords for worn or frayed insulation, loose connections, and broken parts.

2. See that electrical equipment is properly grounded, and all power cords have polarized, three-prong plugs attached.

3. Remove rings, watches, and bracelets when operating machines to reduce possibilities of shock.

4. Use fuses, circuit breakers, or other approved means to prevent accidental overloading of circuits.

5.

Supporting Knowledge Required: Knowledge of basic electrical safety practices.

Worksheet 2 – Continued

TASK ANALYSIS

Learning Activity: Observe safety precautions related to machine operation.

Steps:

1. Make certain that no loose clothing, such as neckties, unbuttoned lab coats, wrist watches, or rings, can become entangled in the machine's drive mechanism.
2. Trimmer blade should never be left in the "up" position.
3. Avoid the possibility of accidental burns by displaying a "hot" warning sign after using a dry-mounting press or tacking iron.
4. Perform prescribed operator maintenance only.
5.

Supporting Knowledge Required: Knowledge of all operating instructions provided by manufacturers of laboratory machines.

Worksheet 3

LEARNING ACTIVITY PACKAGE OUTLINE

Still Photographic Technician Aide

Task: Utilize safety precautions for common electrical, mechanical, and chemical photographic laboratory hazards.

Learning Activity: Observe safety precautions related to fire hazards.

Steps:

1. Maintain clean working areas.
2. Avoid concentrations of flammable or explosive gases and vapors.
3. Determine location of extinguishers.
4. Know the type of extinguisher needed for different types of fires.
5. Know how to use various types of extinguishers.

Supporting Knowledge Required: Understand the four general classes of fire and their related extinguishing agents.

LEARNING ACTIVITY PACKAGE OUTLINE

LAP Objective: In a series of simulation activities, the student will be able to demonstrate knowledge of the four general classes of fire.

Overview: To produce a fire, three things must be present: fuel, heat, and oxygen. If any one of them is removed, the fire will go out. Maintaining a clean working environment is essential to effective fire prevention. Accumulations of rubbish, waste, and residue are all sources of fuel. Concentrations of flammable or explosive gases and vapors can be destructive. Since fires may occur unexpectedly, you must be ready to fight them quickly and effectively. You should know the location of fire extinguishers, the type of extinguisher required to fight the fire, and the proper method for using the extinguisher. Because all fire extinguishing agents cannot be used on all types of fires, knowing the classification of a fire makes it possible to determine the agent best suited for fighting a particular type of fire.

Learning Experiences:

1. Demonstrate the procedure used for fighting a Class A fire. Fires in this classification can be extinguished effectively and safely by water, or solutions containing water. Fires occurring in wood, paper, and rags are typical Class A fires.

2. Demonstrate the procedure used for fighting a Class B fire. Fires caused by flammable liquids, such as gasoline and other fuels, solvents, greases, or similar substances, are termed Class B fires. Agents like CO^2, which dilute or eliminate air by blanketing the fire, are effective on this type of fire.

LEARNING ACTIVITY PACKAGE OUTLINE

3. Demonstrate the procedure used for fighting a Class C fire. Electrical fires come under Class C. Extinguishing agents such as CO^2, which are nonconductors of electricity and work principally to smother the fire, can be used. Extinguishers containing carbon tetrachloride must not be used on electrical fires.

4. Demonstrate the procedure used for fighting a Class D fire. Fires that occur in combustible metals, such as magnesium, potassium, powdered aluminum, zinc, sodium, titanium, zirconium, and lithium are Class D fires. Dry powder extinguishers should be used on all Class D fires.

5. Show and discuss films on proper procedures for fighting the four general classes of fire.

6. Assign background readings and report findings on related aspects of the four general classes of fire.

7. Use other teaching-learning approaches deemed appropriate by the instructor.

Worksheet 3 – Continued

LEARNING ACTIVITY PACKAGE OUTLINE

Summary: Accident records show that of all accidents, 88% are caused by unsafe acts of people, 10% by unsafe conditions which people allow to exist, and only 2% by natural disasters. The identification, isolation, and control of these causes are the framework around which accident prevention programs can be built. Photographic work has a potential for producing accidents: some of the work is performed in total darkness or under extremely low levels of illumination and some of the photographic processes require the use of chemicals that, if used improperly, can cause serious injuries. Protect yourself from possible accidents by paying close attention to prescribed safety policies and procedures.

EVALUATING STUDENT PERFORMANCE

On the next page is offered one method for evaluating student performance on the LAP described above. The Student Evaluation Checklist is based on observing the performance of the student for each step of the learning activity. The learning activity can be designated as one that requires limited skill (L), moderate skill (M), or proficiency (P). As the student performs each step in the LAP, the instructor can rate the student's performance as either satisfactory (S) or unsatisfactory (U). This is an easy way to keep track of each student's performance on LAPs presented over a period of time. It also offers the instructor a means of determining which skills have been mastered and which skills have not been mastered by the student group as a whole. By reviewing these checklists periodically, the instructor can pinpoint the areas of instruction in which students need additional help. (A blank Student Evaluation Checklist is provided at the end of this section for duplication and use by the instructor.)

STUDENT EVALUATION CHECKLIST

Key: L = Limited skill
M = Moderate skill
P = Proficiency

S = Satisfactory
U = Unsatisfactory

Student Name: ______________________

Date: ______________________

Instructor: ______________________

RATING **CRITERIA**

L M P **Learning Activity:** Observe safety precautions related to fire hazards.

S U **Steps:** 1. Maintain clean working areas.

S U 2. Avoid concentrations of flammable or explosive gases and vapors.

S U 3. Determine location of extinguishers.

S U 4. Know the type of extinguisher needed for different types of fires.

S U 5. Know how to use various types of extinguishers.

DEVELOPING LAPS FROM A GENERAL KNOWLEDGE CONCEPT

On the following pages is a sample LAP based on the general knowledge concept of "approximation and estimation." Again, the LAP's four components—objective, overview, learning experiences, and summary—are presented in detail. This LAP is one that students can work through on their own with a minimum of interaction with the instructor.

(SAMPLE LEARNING ACTIVITY PACKAGE
BASED ON A GENERAL KNOWLEDGE CONCEPT)

LEARNING ACTIVITY PACKAGE 1:
APPROXIMATION AND ESTIMATION

OBJECTIVES

When you have completed this unit, you will be correct 85% of the time when you:

1. identify whether numbers in a list are exact or approximate.
2. list reasons why a number is approximate.
3. identify the maximum error, as a tolerance, of measurements you have made.
4. rewrite a list of measurements so that they all are of the same precision.
5. measure an object to a certain degree of precision (tolerance).
6. state the relative error and degree of accuracy of a measurement.
7. round off measurements and numbers to a specified place.
8. estimate a sum, difference, product or quotient to within 10% of the actual value.

OVERVIEW

It is impossible to exactly measure anything. There is always some amount of error in any measurement you make. In everyday life when you make measurements it is often necessary to tell how much in error your measurement is. In this learning activity you will learn about different types of errors and how to let other people know about them when they appear in your work. (The prerequisites for this LAP are satisfactory completion of the LAPs on Base 10, Number Line, Whole Numbers, Fractions, Decimals, Reciprocals, Measurement, Metric System, Averages, Percent, Ratio and Proportion, Square Roots, and Laws of Indices.)

DIAGNOSTIC PRETEST

1. Which of the following are approximate measures? Circle the letter appearing before the measure if it is approximate.

   a. Baseball score: Pittsburgh 3, Chicago 2

   b. Enrollment of Plainview High School: 478 pupils

   c. Springfield area rainfall for 1967: 24.3 inches

   d. World's record for the 100-yard dash: 9.1 seconds

   e. Automobiles manufactured during the month of August at the Dearborn plant: 1,463

2. For each approximate measure in Question 1, write two reasons why it is an approximate measure and not an exact measure.

   ____

   ____

   ____

   ____

   ____

3. Write the maximum error, as a tolerance, for the following measurement:

   249.10 inches maximum error = ____________

4. Rewrite the following measurements so that they are all of the same precision as the example:

   Example: $4\frac{3}{4}$ inches

   a. $6\frac{12}{16}$ inches = ______________

   b. 2.500 inches = ______________

   c. 3.000 inches = ______________

   d. $5\frac{2}{8}$ inches = ______________

5. Measure the diameter of a 25-cent piece to the nearest $\frac{1}{16}$ inch:

____

6. State the relative error, correct to two decimal places, for the measurement made in Question 5:

____

7. State the degree of accuracy, to the nearest whole percent, of the measurement made in Question 5:

____

8. Round off these numerals to the stated number of decimal places:

	Numeral	Places	Rounded-Off Numeral
a.	14.145	1	________________
b.	69.937	0	________________
c.	2410.005	2	________________
d.	3.14159	4	________________

9. Estimate the product of 710 and 45:

____________ __________

Check your answers with the teacher.

LEARNING EXPERIENCES

As you work through the learning experiences, check your answers in the answer section at the back of this package. If you do not understand any of the questions or the answers, ask your teacher for help.

1. Choose a partner to work with you on these questions.

2. Each of you take a separate sheet of paper and independently (this means you should not show one another the piece of paper or talk over what you are doing until you are told to do so):

   a. with a yardstick, measure to the nearest 1/16" the length of the same window pane in your classroom.

   b. with a yardstick, measure to the nearest 1/16" the width of the same window pane in your classroom.

   c. with a yardstick, measure to the nearest 1/16" the height of the same supply cabinet in your classroom.

   d. count the number of students present in your classroom today.

   e. count the number of desk chairs that are in your classroom.

   Write each measurement or count on your piece of paper.

3. After both of you have measured and counted EVERYTHING in Question 2, compare your lists. Circle two of the five things you did which agree most completely on the two lists:

   a, b, c, d, e.

4. List all the reasons you can think of why the other three measurements did not agree completely between the two lists.

   ____

   ____

   ____

   ____

   ____

5. Make each statement true by crossing out the wrong word.

   a. Exact/approximate numbers are the result of measurements.

   b. Exact/approximate numbers are the result of counting.

6. Which of the following are exact or counted measures and which are approximate? Circle the correct choice.

a.	baseball score	exact, approximate
b.	enrollment of your school	exact, approximate
c.	annual rainfall in Pennsylvania	exact, approximate
d.	time to run 50 yards	exact, approximate
e.	tickets sold for the football game	exact, approximate
f.	tractors manufactured in May	exact, approximate

7. Which sources of error from the following list could account for one of the measures in Question 6 being approximate? Write the letter of the measurement from Question 6 after the source of error.

   a. poor eyesight _____

   b. lack of skill _____

   c. lack of experience _____

   d. haste _____

   e. expecting a certain value _____

   f. temperature _____

   g. weather conditions _____

   h. vibration _____

   i. jarring of measuring instrument _____

   j. unexpected strain on measuring instrument _____

   k. bad design of measuring instrument _____

   l. careless calibration of measuring instrument _____

   m. zero error—instrument does not read zero when not measuring anything _____

   n. matching the position of the ends of a measuring stick when the length to be measured is longer than the size of the stick _____

   o. parallax-eye, instrument scale, and object are not properly aligned _____

8. Write a brief definition of what you think "precision" is when it pertains to measurement.

____

____

____

Write a brief definition of what you think "accuracy" is when it pertains to measurement.

____

____

____

Precision

Rule: "The smaller the unit of measurement, the more precise the measurement."

9. Circle the most precise measurement in each series.

a. 1" 1' 1 yd.

b. 1" 10" $\frac{1}{2}$" 1'

c. $\frac{1}{2}$" $\frac{2}{4}$" $\frac{4}{8}$"

d. $5\frac{13}{16}$" $5\frac{6}{8}$" $3\frac{2}{4}$" 7"

10. Rewrite the measurements in Question 9, part d, so that they are all of the same degree of precision. (Hint: 7" may be written as $7\frac{0}{16}$".)

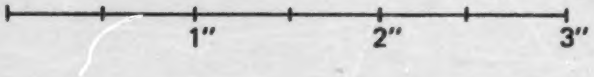
Maximum Error

11. Precision may also be indicated as a TOLERANCE, or by stating the MAXIMUM ERROR of a measurement.

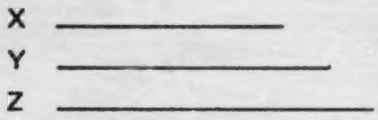
Both maximum error and tolerance depend on the smallest unit or mark that is on the scale of your measuring instrument.

a. What is the smallest unit of measure on Scale M? ______________

Scale M:



Using Scale M, measure the length of each of the following line segments:



b. X = ______________

c. Y = ______________

d. Z = ______________

12. If line segment X were $\frac{1}{8}$" shorter, how long would it be compared to Scale M?

____

13. If line segment Z were $\frac{1}{8}$" longer, how long would it be compared to Scale M?

____

14. A line segment that is $1\frac{1}{2}$" long would include all line segments from 1 — to 1 — on Scale M.

15. A line segment $1\frac{1}{2}$" long could be at most ________ inches shorter or longer than $1\frac{1}{2}$" on Scale M.

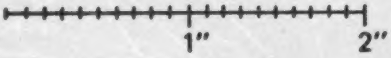
16. This length from Question 15, or one-half the smallest unit or place value of the measurement, is the MAXIMUM ERROR of the unit.

What is the maximum error of:

$1\frac{1}{2}$" ______________

1.5" ______________

17. When you find the maximum error of measurements expressed as decimals you must take one-half of the smallest place value. Thus the maximum error of 1.5" is NOT .25". It is .05", as shown below:



Scale is divided into $\frac{1}{10}$" units.

18. Fill in the blanks:

		Smallest unit or place value	**Maximum error**
a.	$1\frac{1}{4}$ inches	______________	______________
b.	1.3 inches	______________	______________
c.	$9\frac{5}{8}$ inches	______________	______________
d.	12.68 feet	______________	______________
e.	$4\frac{0}{16}$ inches	______________	______________
f.	3 hours 13 minutes	______________	______________

Tolerance

19. Tolerance is a way of expressing the maximum error along with the measurement.

The maximum error of $\frac{1}{4}$" of a measurement of $1\frac{1}{2}$" is expressed in tolerance form:

$$1\frac{1}{2} \pm \frac{1}{4}''$$

20. Rewrite the measurements in Question 18 with their maximum error expressed in tolerance form.

a. ________________ d. ________________

b. ________________ e. ________________

c. ________________ f. ________________

21. Suppose you measured a line to the nearest $\frac{1}{4}$" and found the measurement closer to 5" than to $4\frac{3}{4}$" or $5\frac{1}{4}$".

Why would you record the measurement as $5\frac{0}{4}$" instead of 5"?

____

____

____

Accuracy

22. Take a piece of cardboard which is 3" long and mark one edge off into half inches. Using this new rule, measure the following to the nearest half inch:

a. the diameter of your pencil ________________"

b. the width of the arm of your desk chair ________________"

c. the height of the blackboard ________________"

23. What is the maximum error of each measurement? ________________

24. Are all the measurements in Question 22 equally precise? ________________

25. In Question 22, there is one measurement where the maximum error is more important for accuracy. Which is it: a, b, or c ? (Circle one.)

26. The diameter of the pencil is small compared to the maximum error of the instrument. This means that we will not get an accurate measurement of the diameter no matter how often we measure it.

27. As the size of the object we measured increased, the size of the maximum error became less important. We use the term "relative error" to describe how important this relationship is.

The formula for relative error is:

$$\text{Relative Error} = \frac{\text{Maximum Error}}{\text{Recorded Measurement}}$$

28. Calculate the relative error for b and c of Question 22.

relative error for b ________________

relative error for c ________________

29. Explain in your own words what the term "relative error" means.

30. In Question 28, which relative error is larger: b or c ? (Circle one.)

31. Based on the size of relative errors, which measurement in Question 28 was more accurate: b or c ? (Circle one.)

32. The size of a relative error indicates how accurate your measurement was. Make this sentence true by circling the correct word.

"One measurement is more accurate than another if it has a larger / smaller relative error."

33. Look at the formula for relative error in Question 27. In order for you to reduce the relative error, it is necessary for you to change only one of the other two components of the formula. Which one would you change and how would you change it (make it larger, smaller, etc.)?

34. A "degree of accuracy" may be found by changing the relative error into a percent, and then subtracting this from 100. An acceptable degree of accuracy for most measurements is 95%.

Convert the relative errors in Question 28 into degrees of accuracy.

degree of accuracy for b _______________

degree of accuracy for c _______________

Rounding Off

35. To avoid all confusion when rounding off numbers, use this rule: "If the left-most digit of the part of the number to be dropped is a 0, 1, 2, 3 or 4, drop this whole part of the number."

Example: Round off 6.149 to one decimal place. Answer: 6.1

Round off these numbers to one decimal place:

a. 6.103 _______________

b. 6.113 _______________

c. 6.123 _______________

d. 6.133 _______________

e. 6.143 _______________

36. Another rule to follow when rounding off numbers is: "If the left-most digit of the part of the number to be dropped is a 5, 6, 7, 8 or 9, drop this whole part of the number and add one (1) to the final digit retained."

Example: Round off 6.159 to one decimal place. Answer: 6.2

Round off these numbers to three decimal places:

a. 6.28509 _______________

b. 6.28519 _______________

c. 6.28529 _______________

d. 6.28539 _______________

e. 6.28549 ______________

f. 6.28559 ______________

g. 6.28569 ______________

h. 6.28579 ______________

i. 6.28589 ______________

j. 6.28599 ______________

Estimation

37. Accurate estimation requires the ability to round off numbers correctly. Estimation also implies that you are going to add, subtract, multiply or divide numbers. All of the following estimations can be made using the same technique:

"Estimate the sum of 1981 and 344."
"Estimate the difference of 1981 and 344."
"Estimate the product of 1981 and 344."
"Estimate the quotient of 1981 divided by 344."

38. Estimate the following answers:

a. The sum of 2000 and 300 is ______________.

b. The difference of 2000 minus 300 is ______________.

c. The product of 2000 and 300 is ______________.

d. The quotient of 2000 divided by 300 is ______________.

39. What change was made to the numbers used in Question 37 that resulted in the numbers used in Question 38?

____

____

____

40. Every time you round off numbers that you have to add, subtract, multiply or divide so that you are working with round numbers that consist of a single, non-zero digit and zeros, you should be accurate to within 10% of the actual answer.

List three situations where you could apply this principle:

a. ______________________________

b. ______________________________

c. ______________________________

CRITERION POSTTEST

1. Circle the letter appearing before the measure if it is an approximate measure:

   a. Football score: Kansas City 29, St. Louis 6

   b. Enrollment of Baylor Junior High School: 682 pupils

   c. Rockford area snowfall for 1966: 18.0 inches

   d. World's record for the mile: 3 minutes 51 seconds

   e. Trawlers manufactured during the month of September at the Quincy shipyards: 6

2. For each approximate measure in Question 1, write at least two reasons why it is an approximate measure and not an exact measure.

3. Write the maximum error, as a tolerance, for the following measurement:

   8.63 seconds maximum error = ____________

4. Rewrite the following measurements so that they are all of the same precision as the example:

   Example: 2.20 seconds

   a. $6\frac{1}{5}$ seconds = ________________

   b. 4.859 seconds = ________________

   c. $9\frac{0}{5}$ seconds = ________________

   d. 1.1 seconds = ________________

5. Measure the diameter of a 5-cent piece to the nearest $\frac{1}{16}$ inch:

____

6. State the relative error, correct to two decimal places, for the measurement made in Question 5:

____

7. State the degree of accuracy, to the nearest whole percent, for the measurement made in Question 5:

____

8. Round off these numerals to the stated number of decimal places:

Numeral	Places	Rounded-Off Numeral
a. 8.1818	3	____________________
b. 4.067	0	____________________
c. 3.333	1	____________________
d. 1.2121	2	____________________

9. Estimate the quotient of 39,673 divided by 54:

____

Check your answers with the teacher.

SUMMARY

In this unit you have learned something about types of errors that appear in measurements, some that you would like to reduce or eliminate, and others that you want to make on purpose such as in rounding off or in estimating. Whenever you must add, subtract, multiply, or divide measurements you may increase your errors unless you know what to do and exactly when to round off.

REFERENCES

1. Glenn, W. H., & Johnson, D. A. Invitation to mathematics. Garden City, N.Y.: Doubleday,
2. Larsen, H. D., & Ludlow, H. G. Arithmetic for colleges. New York: Macmillan, 1963.
3. Rassweiler, M., & Harris, J. M. Mathematics and measurements. Dubuque, Ia.: Wm. C. Brown Book Co., 1962.

ANSWER KEY FOR QUESTIONS 1–40

1. No answer.

2. Varies with the size of the objects.

3. d, e

4. Different for each student—accept, if logical.

5.
   a. approximate
   b. exact

6.
   a. exact
   b. exact
   c. approximate
   d. approximate
   e. exact
   f. exact

7. c and d should appear after all except n.

8. Different for each student.

9.
   a. 1"
   b. $\frac{1}{2}$"
   c. $\frac{4}{8}$"
   d. $5\frac{13}{16}$"

10. $5\frac{13}{16}$" $5\frac{12}{16}$" $3\frac{8}{16}$" $7\frac{0}{16}$"

11. a. $\frac{1}{2}$"

b. $1\frac{1}{2}$"

c. $1\frac{1}{2}$"

d. $1\frac{1}{2}$"

12. 1"

13. 2"

14. $\frac{1}{4}$" $\frac{3}{4}$"

15. $\frac{1}{4}$"

16. $\frac{1}{4}$" .05"

17. No answer.

18. a. $\frac{1}{4}$" $\frac{1}{8}$"

b. .1" .05"

c. $\frac{1}{8}$" $\frac{1}{16}$"

d. .01' .005'

e. $\frac{1}{16}$' $\frac{1}{32}$"

f. 1 minute 30 seconds, or .5 minutes

19. No answer.

20. a. $1\frac{1}{4} \pm \frac{1}{8}$"

b. 1.3 ± .05"

c. $9\frac{5}{8} \pm \frac{1}{16}$"

d. 12.68 ± .005'

e. $4\frac{0}{16} \pm \frac{1}{32}$"

f. 3 hours 13 minutes ± 30 seconds

21. $5\frac{0}{4}$" shows that the measurement was made to the precision of $\frac{1}{4}$", which is correct. 5" implies the measurement was made to a precision of 1", which is incorrect.

22. Varies with the size of the objects.

23. $\frac{1}{4}$"

24. Yes

25. a

26. No answer.

27. No answer.

28. Varies with the size of the object.

29. Different for each student. Could be "Relative error describes the relationship (or compares the sizes) of the maximum error of a measurement and the measurement itself."

30. b

31. c

32. Smaller

33. Maximum error—make it smaller by measuring to a greater precision.

34. Varies with the size of the object.

35.
- a. 6.1
- b. 6.1
- c. 6.1
- d. 6.1
- e. 6.1

36.
- a. 6.285
- b. 6.285
- c. 6.285
- d. 6.285
- e. 6.285
- f. 6.286
- g. 6.286
- h. 6.286
- i. 6.286
- j. 6.286

37. No answer.

38. a. 2300 b. 1700 c. 600,000 d. 6 (approximately)

39. They were rounded off to one digit. The digits dropped were replaced by zeros.

40. Different for each student.

WORKSHEETS

On the following pages are blank worksheets and a student evaluation checklist which can be duplicated and used for developing learning activity packages for the still photographic technician aide training program.

Worksheet 1

TASK LISTING

Job: ____________________

Task: ____________________

____

Related Tasks:

1. ____________________

____

2. ____________________

____

3. ____________________

____

4. ____________________

____

5. ____________________

____

6. ____________________

____

7. ____________________

____

8 ____________________

____

9 ____________________

____

10. ____________________

____

Worksheet 2

TASK ANALYSIS

Job: ______________________________

Task: ______________________________

____

Learning Conditions: ______________________________

____

Outcome: ______________________________

____

Learning Activity: ______________________________

Steps: 1. ______________________________

____

2. ______________________________

____

3. ______________________________

____

4. ______________________________

____

5. ______________________________

____

Supporting Knowledge Required: ______________________________

____

____

Worksheet 2 – Continued

TASK ANALYSIS

Learning Activity: ____________________

Steps:

1. ____________________

2. ____________________

3. ____________________

4. ____________________

5. ____________________

Supporting Knowledge Required: ____________________

Worksheet 3

LEARNING ACTIVITY PACKAGE OUTLINE

Job: ______________________________

Task: ______________________________

____

Learning Activity: ______________________________

Steps:
1. ______________________________
   ____
2. ______________________________
   ____
3. ______________________________
   ____
4. ______________________________
   ____
5. ______________________________
   ____

Supporting Knowledge Required: ______________________________

____

____

____

Worksheet 3 – Continued

LEARNING ACTIVITY PACKAGE OUTLINE

LAP Objective: ______________________________

____

Overview: ______________________________

____

____

____

____

____

____

____

____

____

____

____

Learning Experiences:

1. ______________________________

____

____

____

____

2. ______________________________

____

____

____

____

Worksheet 3 – Continued

LEARNING ACTIVITY PACKAGE OUTLINE

3. ______________________________

4. ______________________________

5. ______________________________

6. ______________________________

7. ______________________________

Worksheet 3 – Continued

LEARNING ACTIVITY PACKAGE OUTLINE

Summary:

STUDENT EVALUATION CHECKLIST

Key: L = Limited skill
M = Moderate skill
P = Proficiency

S = Satisfactory
U = Unsatisfactory

Student Name: ____________________

Date: ____________________

Instructor: ____________________

RATING **CRITERIA**

L M P Learning Activity: ____________________

S U Steps: 1. ____________________
____

S U 2. ____________________
____

S U 3. ____________________
____

S U 4. ____________________
____

S U 5. ____________________
____

SECTION 1.6

How to Select an Instructional Method

A better understanding of how people learn and the evolution of modern teaching and learning aids have resulted in the development of a variety of instructional methods. This section discusses eight of the most commonly used methods: lecture, conference, demonstration, performance, programmed instruction, study assignment, tutoring, and a combination of any of these.

Every instructional method has certain advantages and disadvantages, so it is important that the method selected is the one which will be most effective and efficient. Choosing an instructional method must be based on a careful analysis of the factors involved in the learning situation: instructional objectives, course content, student population, instructor, facilities, equipment, instructional materials, time, and costs. This section describes these factors as they relate to each of the eight instructional methods.

SELECTING AN INSTRUCTIONAL METHOD

Except for the selection of training objectives, the proper selection of instructional methods will do more to promote instructional efficiency and effectiveness than any other measure. Many times this fact is overlooked in training and education. All too often the selection of instructional methods is dictated by expediency rather than choice. An instructional method or methods must be selected through systematic means if inefficiency in attaining the course objectives—or worse, failure to achieve objectives—is to be avoided.

There is no single best method of teaching which applies to all learning situations or instructional objectives. The instructor must choose the method that is most compatible with the instructional objectives, the nature of the school organization, the facilities and equipment available, the background and level of the students, and the instructor's own abilities.

Instructional Objectives. The accomplished instructor is one who has developed skill in using a great variety of instructional methods. For each course objective, the instructor can select from a variety of methods, one or more of which will lead to effective learning. The instructor who is limited in methods often tries to reach an objective by using inappropriate techniques. The result is a lack of student interest and attention, inefficient learning, or failure to achieve the instructional goals.

Too many instructors use only one or two methods. Many instructors lecture most of the time. Today, with the great variety of interesting and effective ways of helping students learn, the instructor should develop a repertoire of approaches. Then, rather than use the same methods for all lessons, he or she can draw from this repertoire the ones which are most appropriate for a particular situation.

Course Content. The nature of the course content must be considered in selecting an instructional method. The difficulty of the content and the kinds of skills and knowledge required determine to a great extent the methods which are most appropriate.

Student Population. The size of the student group and their educational level, prior training, aptitudes, maturity, and reading and speaking ability must be considered in selecting instructional methods.

Instructor. The number, quality, and competencies of available instructors is an important factor to consider in selecting instructional methods.

Facilities, Equipment, and Instructional Materials. Each instructional method requires the use of specific types of facilities, equipment, and materials. If the proper facilities are not available, an alternative method may be required.

Time. The time available for a particular block of instruction also governs the method selected. If instructional time is extremely limited, an alternative to the most effective method may be required.

Costs. The costs involved in using a particular method cannot be separated from the other factors. Time, facilities, personnel, and equipment all involve costs. These factors must be taken into account when selecting instructional methods.

THE LECTURE METHOD

A lecture is a semiformal presentation by the instructor of a series of events, facts, concepts, or principles, an exploration of a problem, or an explanation of relationships. Students participate in a lecture mainly as listeners. A lecture is basically a means of telling students information they need to know. This does not mean, however, that all the talking done by the instructor during a class period can be termed a lecture. The term should be reserved to describe a more structured presentation which is used to achieve an instructional objective.

Uses. The purpose of a lecture is to inform. The instructor has information which he or she wishes to transmit to students by means of oral communication. Some of the more appropriate uses of the lecture are:

- to orient students to course policies, rules, procedures, purposes, and learning resources.

- to introduce a subject, indicate its importance, and present an overview of its scope.

- to give directions on procedures for use in subsequent learning activities.

- to present basic material which will provide a common background for subsequent activities.

- to set the stage for demonstration, discussion, or performance.

- to illustrate the application of rules, principles, or concepts.

- to review, clarify, emphasize, or summarize.

Advantages. A properly planned and skillfully delivered lecture is an effective method when used in appropriate situations. Some of the reasons why the lecture is one of the most widely used methods of instruction are that it:

- saves time. The lecture method saves time because the instructor can present more material in a given amount of time than he or she can by any other method.

- permits flexibility of class size. The size of a class is limited only by the size of the classroom to be used or the efficiency of the public address system.

- requires less rigid space requirements. The lecture can be used effectively in any type of training area, indoors or outdoors. The only requirement is that the trainees must be able to hear the lecturer.

- permits adaptability. A skillful lecturer can modify or adjust his or her materials' sequence, vocabulary, and illustrations to meet the needs of a specific group. This makes it possible to present content which is appropriate for the educational level, training, and past experience of the class.

- permits versatility. The lecture can be used for orientation, introduction, review, clarification, and summary. It can be used at any point in a course, and it can be combined easily and effectively with any other method of instruction.

- permits better control over content and sequence. Because the instructor determines what is to be presented and the order of presentation, the desired coverage and sequence can be accomplished with little danger of engaging in time-consuming detours.

Disadvantages. Some of the disadvantages of the lecture method are that it:

- involves one-way communication. The instructor prepares and presents the material. The student sits, listens, and takes notes. Most lectures, therefore, permit little or no interchange of ideas between the instructor and the students. All ideas presented to the class originate with the instructor.

- poses problems in skill teaching. The lecture method is an inappropriate way to teach skills such as equipment operation.

- appeals mainly to one sense. Most learning takes place through the visual sense. The lecture, even if supplemented by training aids, appeals mainly to the auditory sense. Unless the content is interesting and challenging enough to hold the attention of the class, the results are likely to fall short of the instructional goal.

- contributes to student passiveness. During a lecture, students are passive. Their job is to listen. Attention is difficult to attract and retain. Outside disturbances easily and frequently distract the students and make the lecture ineffective.

- poses evaluation problems. If an instructor is to teach rather than merely present information, he or she must be aware of student reactions, misconceptions, inattention, and difficulties, and he or she must remedy them immediately. The lecture method makes these perceptions difficult. Most students have acquired the ability to appear attentive, although they may not even be listening. The lecturer receives very little feedback, and much of what he or she does receive is often misleading.

- depends on the skill of the instructor. In a lecture, student interest and attention must be generated by the instructor. The instructor must plan carefully, display sincerity and enthusiasm, present material in a proper sequence, use appropriate vocabulary, employ effective speaking techniques, be sensitive to the reaction of the students, and modify the presentation on the basis of class response. Failure to do any of these things will result in a loss of student attention and interest, and a failure to achieve the objectives of instruction. The ultimate success of a lecture depends on the skill of the instructor.

THE CONFERENCE METHOD

The conference is a method in which group discussion techniques are used to reach instructional objectives. These discussion techniques include questions, answers, and comments from the instructor in combination with questions, answers, and comments from the students, and are directed toward learning goals. There are three types of conferences: directed discussion, training conferences, and seminars. Clear distinctions do not exist between any of these forms; however, the objectives of the conference, and the kind and amount of student participation, determine when a directed discussion becomes a training conference, and when a training conference becomes a seminar.

The objective of a **directed discussion** is to help students acquire a better understanding of and develop an ability to apply known facts, principles, concepts, policies or procedures. The function of the instructor is to guide the student discussion in such a way that the facts, principles, concepts, or procedures are clearly articulated and applied.

In a **training conference**, the objective is to pool the knowledge and past experience of the students to arrive at improved or more clearly stated principles, concepts, policies or procedures. The topics discussed in a training conference are less likely to have pat answers than those used in a directed discussion. The task of the instructor is to elicit contributions from the group based on their past experiences which have a bearing on the topic at hand.

The purpose of the **seminar** is to find an answer to a question or a solution to a problem. The instructor does not have an answer or a solution; in fact, there is no known best or correct solution. Rather, the instructor is seeking an answer and encourages the students to develop one. The primary functions of the instructor are to describe the problem as he or she understands it and to encourage free and full participation in a discussion aimed at: identifying the real problem, gathering and analyzing data, formulating and testing hypotheses, determining and evaluating alternative courses of action, arriving at conclusions, or making recommendations to support or arrive at a solution or a decision.

Uses. The conference method is a valuable tool in the instructor's kit. Some of the more important applications of this method are:

- to develop imaginative solutions to problems.
- to stimulate interest and thinking, and to secure student participation in situations which would otherwise allow the class to remain passive.
- to emphasize the main teaching points.
- to supplement lectures, readings or laboratory exercises.
- to determine how well students understand concepts and principles, and to determine if they are ready to proceed to new or more advanced material.
- to prepare students for the application of a theory or procedure to specific situations.
- to summarize, clarify, or review.
- to prepare students for subsequent instruction.
- to determine student progress and the effectiveness of prior instruction.

Advantages. Some of the advantages of the conference method are that it:

- increases student interest. The opportunity to express one's own views and to hear the opinions of others is stimulating. Interest is unusually high in a well-planned and skillfully conducted conference.

- increases student acceptance and commitment. Because students actively participate in developing the lesson, they tend to accept the importance and validity of the content and are more deeply committed to solutions or decisions than they would be if the content were merely presented to them.

- utilizes student knowledge and experience. The conference method enables the instructor to make effective use of the students' backgrounds, previously acquired knowledge, and experiences. The entire class and the instructor benefit from the experience and thinking of all students.

- results in more permanent learning. Learning takes place in direct ratio to the amount of individual participation in the learning process. The conference demands a high degree of student participation, thereby promoting better and more permanent learning.

Disadvantages. Some of the disadvantages of this method are that it:

- requires highly skilled instructors. The conference is more exacting of the resourcefulness, initiative, and ability of the instructor. The instructor must be able to guide the discussion without appearing to do so. He or she must be thoroughly informed on all aspects of the subject under discussion. The instructor must also: keep the discussion on the track, minimize debate over unimportant details, relate comments to topics previously discussed, avoid reopening topics already discussed, encourage and get full participation, prevent domination by a few students, summarize each topic, and bring the discussion to a close.

- requires preparation by students. Most conferences require advance preparation in the form of reading assignments, thinking, and study before the meeting. The thoroughness of the preparation determines the quality of the discussion and the outcome of the conference. Little or no instructor control can be insured over the quality or thoroughness of student preparation. This results in variation among students in their readiness to participate in the conference.

- limits content. The content appropriate for discussion is restricted. Manipulative operations, functions, procedures, or introductory materials do not ordinarily provide suitable content for a conference.

- consumes time. Relatively large blocks of time must be allocated if a discussion is to be profitable. For this reason, the conference is often ruled out as an approach although it may be well suited to the subject and the class.

- restricts size of group. The conference method cannot be used effectively with groups larger than 12 to 15 students, because the opportunity for individual participation is too limited. More reticent members are likely to be left out of the discussion and denied valuable learning experiences.

- requires selective group composition. The members of a conference group, in most cases, must possess the proper background, maturity, and motivation if the discussion is to be profitable. The desired degree of participation is difficult to obtain if the group is composed of one subgroup which has ample experience in the area to be discussed and another subgroup which has extremely limited experience.

THE DEMONSTRATION METHOD

A demonstration is a method of instruction where the instructor, by actually performing an operation or doing a job, shows the student what to do and how to do it, and through explanations brings out why, where, and when it is done. Usually the student is expected to be able to repeat the job or operation after the demonstration. For this reason, the demonstration is often used in conjunction with another method. The most common combinations are the lecture-demonstration and the demonstration-performance.

Uses. The basic purpose of a demonstration is to show how something is done. It should be employed wherever and whenever practicable. Some of its more important applications are:

- to teach manipulative operations or procedures, or how something is done.

- to teach problem-solving and analytical skills.

- to illustrate principles, or why something works.

- to teach the operation or functioning of equipment, or how something works.

- to teach teamwork, or how people work together to do something.

- to set standards of performance.

- to teach safety procedures.

Advantages. Some of the advantages of the demonstration method are that it:

- improves learning. Students learn faster and more permanently with a demonstration. A demonstration makes explanations concrete by giving meaning to words. Relationships between steps of a procedure and the accomplishment of the objective are clarified in a demonstration. Students not only see and hear during a demonstration, they are often given the opportunity to touch the equipment. When well planned and executed, a demonstration has a dramatic quality which arouses and sustains interest and attention.

- minimizes damage and waste. Equipment is often damaged when students attempt to operate it without proper guidance. Much of this damage and waste can be prevented by the use of demonstrations.

- saves time. A properly planned demonstration takes much less student time than other methods. It reduces oral explanation time and at the same time prevents misunderstandings about how a system or a piece of equipment works.

- can be presented to large groups. Class size is limited only by the ability of the group to see the object being demonstrated. The use of large-scale mockups or models makes it possible to teach many operations to large classes.

Disadvantages. Some of the disadvantages of this method are that it:

- requires careful preparation and rehearsal. A demonstration should set a standard of performance for students. The procedure must be technically correct and must be performed with a skill greater than that expected of students. The instructor must be sure that the equipment is in working order. Nothing fails as completely as a demonstration that doesn't work.

- requires special classroom arrangements. The demonstration room must be set up so that all students can clearly see every phase of the demonstration.

- requires equipment and aids. The equipment, often expensive, must be taken out of an operational setting. Therefore, the removal of this equipment must be offset by gains in training. Sometimes, models or mockups must be purchased or constructed. These represent a rather costly investment of time, money, and other resources.

THE PERFORMANCE METHOD

The performance method requires the student to perform, under controlled conditions, the operation, skill, or movement being taught. Performance is learning by doing.

There are four basic types of performance. **Independent practice** requires students to work individually at their own pace. In **group performance** or **controlled practice**, students work together step-by-step at the rate set by the instructor. The **coach and pupil** method involves pairing students. Members of each pair perform alternately as instructor and student. In **team performance**, a group of students perform an operation or function as a team.

Uses. In general, the performance method has the same applications as the demonstration method and is used as follow-on instruction:

- to teach manipulative operations or procedures.

- to teach the operation or functioning of equipment.

- to teach team skills.

- to teach safety procedures.

Advantages. The main advantages of the performance method are that it:

- builds confidence. Given the opportunity to apply their knowledge in a realistic situation, students develop confidence in their ability and a positive attitude toward the learning situation.

- increases learning. Active student participation is maximized. This fact, coupled with the interest and attention generated by putting theory into practice, increases both the amount and the permanence of learning.

- enables learning evaluation. With the performance method the instructor has an opportunity to observe the degree of learning attained by each student, to identify students having difficulty, and to determine if there have been weak areas in the instruction.

- reduces damage and waste. Because performance is guided, students are less likely to make mistakes which will damage equipment or waste materials.

- promotes safety. Guided performance makes it possible to emphasize the proper method of performance and helps prevent accidents.

Disadvantages. Some of the disadvantages of the performance method are that it:

- requires tools and equipment. If a practical exercise is to be conducted, every student must participate fully. Therefore, tools and properly functioning equipment must be available in sufficient quantity for the size of the class.

- requires large blocks of time. A well-run practical exercise is often time-consuming in its requirements for setting up the room and equipment, and in accomplishing the actual setting up of the room and equipment for individual or team performance of the complete operation.

- requires more instructors. Unless the class is very small, a number of qualified instructors are required to keep a constant check on the progress of each student, to give assistance when needed, and to evaluate the quality of the performance.

PROGRAMMED INSTRUCTION METHOD

Programmed instruction is a method of self-instruction in which the student works through a carefully sequenced and pretested series of steps leading to the acquisition of knowledge or skills representing the instructional objectives. The student proceeds through the program at his or her own rate, responds actively to each step in the sequence, and receives immediate feedback on the correctness of his or her response before proceeding to the next step. Programs are usually designed to permit the student to master the desired knowledge or skills.

Uses. The programmed instruction method can be used:

- to provide remedial instruction.

- to provide makeup instruction for late arrivals, absentees, or transients.

- to maintain previously learned skills which are not performed frequently enough to insure an acceptable level of proficiency.

- to provide retraining on equipment and procedures which have become obsolete or have been replaced since the original training was given.

- to upgrade production, administrative, or other types of skills and knowledges.

- to accelerate capable students and thereby enable them to complete a course in less than the usual amount of time.

- to provide a means of insuring enough common background among students to profit from formal classroom work.

- to provide the review and practice of knowledge and skills needed to "set" the learning.

- to provide a source of vertical enrichment (advanced work) or horizontal enrichment (broader contact) in a content area.

- to control the variables in a learning situation for experimental purposes.

Advantages. The advantages of programmed instruction are that it:

- reduces the failure rate. The student failure rate is reduced because programs are tested and validated before they are used. This procedure insures that the program is effective in performing the instructional job. The self-pacing feature of the material also helps, because students are exposed to the material at a rate which is appropriate for each individual. The "forced" response and immediate confirmation features guarantee continuous attention to the material, correct wrong responses, and prevent misinterpretation and the practice of errors.

- improves end-of-course proficiency. The pretesting, self-pacing, forced attention, and immediate feedback features of programs result in better, more efficient, and more permanent learning. Thus, end-of-course proficiency is markedly increased.

- saves time. The rigid control over content made possible by the procedures used for developing, testing, and validating programs prevents the introduction of unnecessary content and thereby reduces the time required to learn the critical material. The self-pacing feature, along with forced attention, decreases the teaching time required, and frequently results in an average time savings of 30 percent or more over conventional instructional methods.

- standardizes instruction. The instructional content and sequence of a program are predetermined. They are not subject to the whims, preferences, experiences, or biases of the instructor. The quality of instruction does not vary from day to day nor from instructor to instructor. There is almost complete control over the content, sequence, and form of student responses. Hence, instruction becomes standardized and can be repeated without change at any time for any individual or group.

- requires no special facilities. Programmed materials can be used anywhere at any time. No specially equipped rooms or facilities are necessary.

- provides for self-instruction. Although under ordinary conditions programs are not used as substitutes for instructors, they can be so used. Programs are validated under conditions where they alone do the teaching. Therefore, they are effective instructional materials even if no qualified instructor is available.

- accommodates student differences. Programs can be designed to accommodate wide differences in aptitude, ability, speed of learning, prior training, and experience. The needs of students, whether for more or less exposure, detail, or practice, can be met. The size of a class is also unimportant. Programs can be used to achieve group or individual progress.

- improves efficiency and economy for group or individual instruction. The self-pacing feature and the handling of large or small groups make for greater efficiency and economy. In addition, programs free instructors from routine, repetitive teaching tasks and enable them to spend a larger part of their time on more difficult or more demanding aspects of instruction.

Disadvantages. The disadvantages of the programmed instruction method are that it:

- requires local or commercial preparation. Although the number of available programs is growing rapidly, those which may be used locally are limited. Most programs produced by commercial publishers or other sources do not match the instructional objectives of local courses. For this reason, programs must be developed locally or contracted with commercial programming companies.

- requires lengthy programmer training. Very few trained programmers are available locally. The training program is relatively lengthy and demanding. Only a small percentage of persons exposed to programmer training will become competent programmers.

- increases expenses. Programs, whether developed locally or contracted, are extremely costly. For local development there must be a large investment in programmer training and an even larger one in program writing, testing, and validation. Program development by contract is expensive, and the time required by subject-matter experts and technicians for consulting with programmers and reviewing draft materials is considerable.

- requires considerable lead time. Programmed materials cannot be selected or developed quickly. Lead time is required to screen and select appropriate programs from those available. If programs are developed by school staff or contract programmers, the lead time for production, testing, and validation is even greater. If the course content is unstable or subject to frequent and radical change, it is inappropriate for programming.

- demands competent instructors. Instructors must be able to motivate students to complete programs. They must be able to assist any student at any point in the programmed sequence. If instructors are to be able to provide the motivation, guidance, and assistance required for the optimum use of programmed materials, they must have: insight into the learning process; a thorough understanding of the rationale, principles, construction, and use of programming; skill in conducting tutorial-type instruction and individual counseling; and a mastery of the subject matter of the programs used.

- **requires mature students.** The use of programs requires a student group which is mature enough and sufficiently well motivated to work independently. Also, they must be able to read at the level required for full understanding of the program.

- **poses administrative problems.** The use of programmed materials creates unique administrative problems. Foremost among these are the scheduling and assignment problems caused by the self-pacing feature of programs. This feature results in different phase and course completion times with consequent difficulties in scheduling following instruction and assigning graduates to field units.

THE STUDY ASSIGNMENT METHOD

The study assignment is a method in which the instructor assigns readings in books, periodicals, manuals, or handouts; requires the completion of a project or research paper; or assigns problems and exercises for the practice of a skill. This method involves imposing a task, providing for student motivation, and giving general directions for carrying out the assignment. Implicit in this method are the problems of setting up worthwhile learning activities and anticipating student difficulties and means of overcoming them. If these steps are not well handled, the objectives of the assignment are not likely to be achieved.

The study assignment has two basic forms. In an **independent study** the student carries out the assignment without instructor assistance or direct guidance. In a **supervised study** the student carries out the assignment with an instructor available for guidance and assistance.

Uses. The study assignment method can be used:

- to orient students to a topic prior to classroom or laboratory work.

- to set the stage for a lecture, demonstration, or discussion.

- to provide for or capitalize on individual differences in ability, background, or experience through differentiated assignments.

- to provide for the review of material covered in class or to give the practice essential for the development of skills and problem-solving ability.

- to provide enrichment material.

Advantages. Some of the advantages of the study assignment method are that it:

- increases coverage of material. A far greater amount of material, and detailed treatment of it, can be covered in a shorter period of time by study assignments than by any other means.

- reduces classroom time. Used properly, study assignments can serve as a substitute for lectures; study assignments can make lectures, demonstrations, and conferences more meaningful and more productive.

- improves learning. Practice is essential to the development of skills. Study assignments provide a means of giving enough practice to insure mastery of the skill.

- permits individualized attention. Study assignments can be designed to make use of the experience, special skills, or interests of students, or to remedy individual deficiencies in skill or knowledge.

- reduces instructor interpretation. Students may be referred to the original source instead of being exposed only to the instructor's interpretation. This insures that the content will be presented as intended by the originator of the material.

Disadvantages. Some of the disadvantages of this method are that it:

- requires careful planning and follow-up. If students are not well motivated, they are not likely to do a thorough job with assignments, especially those which they must do on their own. The instructor must plan and assign work in such a way that the objectives and instructions are clear and the motivation is present. The instructor also must follow up to insure that the assignment has been carried out.

- poses evaluation problems. The effectiveness of study assignments is difficult for an instructor to evaluate. It is also difficult for him or her to determine what went wrong with a study assignment when the results are not as good as anticipated.

- results in the practice of errors. In skill development it is critical that the skill be practiced in the prescribed mode. Particularly with independent practice, there is a danger that the student will practice an incorrect procedure or error. When this occurs, a large expenditure of time is required to "unlearn" the skill and "relearn" it correctly.

- produces nonstandard results. The variations in reading ability and differences in motivation in any group produce varying degrees of learning when study assignments are used. Where standardization of learning is essential, study assignments may be inappropriate.

THE TUTORING METHOD

Tutoring is a method of instruction in which an instructor works directly with an individual student. The method may involve exposition, demonstration, questioning, coaching, or guided practice.

Uses. Tutoring can be used:

- to teach highly complex skills and operations, or operations which involve potential danger to students or hazards to expensive equipment.
- to provide individualized remedial assistance.

Advantages. Some of the advantages of tutoring are that it:

- permits adaptive instruction. Tutoring provides the optimum in individualized instruction. The needs of the individual student can be diagnosed and instruction can be tailored to meet his or her unique needs.

- stimulates active participation. In a tutorial setting, the highest possible degree of student participation can be achieved. Direct involvement in the learning, by answering and asking questions, by performing under supervision, is guaranteed.

- promotes effective learning. The ability of the tutor to adapt instruction to the needs of the individual, together with the high degree of interaction and participation of the student, make this method extremely effective in achieving instructional objectives.

- promotes safety. The one-to-one instructor-student ratio provides close control over performance of hazardous operations, resulting in the prevention of injury to the operator or damage to the equipment.

Disadvantages. Some of the disadvantages of this method are that it:

- requires highly competent instructors. Tutoring is one of the most demanding types of instruction to conduct. It requires complete mastery of the content and skill in diagnosing and remedying learning difficulties.

- demands time and money. Tutoring is probably the most expensive method of teaching. Although only one student is receiving instruction, instructor preparation and presentation time are essentially the same as they would be for a whole class of students.

THE COMBINATION METHOD

This is a method of instruction which uses two or more basic instructional methods in combination. For example, one lesson might include a study assignment, a lecture in which safety precautions in handling a piece of equipment are emphasized, a demonstration by the instructor, and, finally, performance by the students.

Uses. Combination lessons can be used to meet almost any type of instructional objective in any training situation. However, they are most appropriate where skill development is involved.

Advantages. The advantages of using a combination of methods are that they:

- increase interest. The variety of methods used in a combination lesson make for a more interesting and engaging instructional period.

- promote flexibility. The use of several methods frees the instructor from the restricting or limiting aspects of any single method. He or she can easily adjust the lesson to the needs of the class and the requirements of the situation.

- improve learning. The combination lesson maximizes the advantages of any single method. It allows the instructor to use approaches which complement each other. This fact, plus the advantage of higher student interest, results in improved learning.

Disadvantages. The disadvantages of using a combination of methods are that they:

- require highly skilled instructors. Instructors must be able to use all methods of instruction with a high degree of skill.

- require smaller groups. The use of methods in combination requires closer control by the instructor and better supervision of student activities. To obtain the desired control, classes must be kept small.

SECTION 1.7

Teaching-Learning Resources for the Instructor

Section 1.7 provides the instructor with a variety of instructional resources and references for use in still photographic technician aide curriculum development efforts. Listed here are audio-visual resources, texts and reference materials, sources of career opportunities, educational development information, and additional information and assistance.

Amphoto, East Gate and Zeckendorf Boulevards, Garden City, NY 11530 (A catalog of all available materials can be obtained upon request.)

Textbooks and Manuals

Amphoto Color Film and Processing Data Book by John S. Carroll. 168 pp., $3.95.

Amphoto Black & White Processing Data Book by John S. Carroll. 224 pp., $4.95.

Amphoto Black & White Film Data Book by John S. Carroll. 128 pp., $3.95.

Minolta SR-T 102/101/100 Guide by John C. Wolf. 128 pp., $4.50.

The Nikkormat Book by Clyde Reynolds. 128 pp., $8.95.

The Honeywell Pentax Book by Clyde Reynolds. 128 pp., $8.95.

The Minolta Book by Clyde Reynolds. 128 pp., $8.95.

The Canon Manual by Paul Jonas. 160 pp., $10.95.

Rollei SL66 and SLX Way by L. A. Mannheim. $22.50.

Miranda Sensorex Guide by W. D. Emanuel. 96 pp., $2.75.

Bigger and Better Enlarging by D. Nibbelink and R. Anderson. $9.95.

The Complete Art of Printing and Enlarging by O. R. Croy. $13.95.

Guide to Your Photo Darkroom by H. D. Shumway. $2.75.

35MM Negs and Prints: And How to Get the Most from Them by Y. Ernest Satow. $7.95.

Eastman Kodak Company, Rochester, NY 14650 (A catalog of all available materials can be obtained upon request. Many items are subject to bulk discount rates.)

Career Education Materials

Photography Is . . . (ED-10-4), 80 slides, narrated tape, printed script, $15.00.

Ideas Won't Keep (ED-10-5), 80 slides, narrated tape, printed script, $15.00.

Worlds Within Worlds (ED-10-6), 80 slides, narrated tape, printed script, carousel slide tray, $25.00.

Worth How Many Words, 16mm color-sound film, 10 minutes, available on short-term loan basis only.

Instructional Materials

Classroom Projects Using Photography—Part II for the Secondary School Level (ED-12-1), $6.95.

Outline for Teaching a Course in Basic Photography (AT-105), $1.75.

Outline for Teaching a Course in Basic Darkroom Technique (AT-107), $1.30.

Outline for Teaching a Course in Advanced Photography (AT-108), $1.90.

Line Photography Curriculum Guide (ED-10-7) includes instruction guide, student workbook, technical manuals, $7.00.

Halftone Photography Curriculum Guide (ED-10-8) includes instruction guide, student workbook, technical manuals, $7.00.

Color Separation Curriculum Guide (ED-10-10) includes instruction guide, student workbooks, technical manuals, $10.00.

An Introduction to Photographic Processing (ED-10-12), slides, script, teacher's manual, learning aids, $15.00.

Basic Photographic Sensitometry Workbook (Z-22-ED), $1.50.

Basic Chemistry of Photographic Processing (Z-23-ED), $2.00.

Kodak Color Print Inspector Training Program (Z-14), nine-booklet series, $195.00.

Kodak Color Print Ring-a-Round Chart (Z-15), $3.00.

Introduction to Color Processing Monitoring (Z-99), $2.00.

Process Monitoring of Kodak Black-and-White Films (Z-126), $2.00.

Photography Publications

Filters for Black-and-White and Color Pictures (AB-1), $0.95.

Creative Darkroom Techniques (AG-18), $6.95.

Kodak Master Photoguide (AR-21), $3.95.

Kodak Photographic Notebook (AW-22), $3.25.

Printing Color Negatives (E-66), $2.50.

Professional Printing in Black-and-White (G-5), $1.00.

Ultraviolet and Fluorescence Photography (M-27), $2.25.

Fire and Arson Photography (M-67), $0.25.

Basic Scientific Photography (N-9), $1.25.

Kodak Darkroom Dataguide (R-20), $8.95.

McKnight Publishing Company, Bloomington, IL 61701 (A catalog of all materials can be obtained upon request. School discounts and textbook adoption evaluation services are available.)

Textbooks and Manuals

Practical Photography by Robert A. McCoy. 340 pp., $6.99.

Photo-Offset Fundamentals by John Cogoli. 443 pp., $7.98.

Photo-Offset Fundamentals Study Guide by John Cogoli. 106 pp., $1.98.

Morgan and Morgan, Inc., 145 Palisade Street, Dobbs Ferry, NY 10522 (A catalog of all materials is available upon request. Many items are subject to bulk discount rates.)

Textbooks and Manuals

An Age of Cameras by Edward Holmes. 150 pp., 275 illustrations, $19.95.

The Craft of Photography by David Vestal. 364 pp., $12.50.

Darkroom Techniques by Ronald Spillman. 140 pp., photos, diagrams, $9.95.

Exposure Manual by J. F. Dunn and G. L. Wakefield. 226 pp., charts, diagrams, and photographs, $19.95.

The Reproduction of Color in Photography, Printing and Television by R. W. G. Hunt. 615 pp., photographs and diagrams, $25.00.

Ansel Adams' Basic Photo Series by Ansel Adams.

Book 1: Camera and Lens, 304 pp., $13.50.

Book 2: The Negative, 120 pp., $6.95.

Book 3: The Print, 120 pp., $6.95.

Book 4: Natural-Light Photography, 118 pp., $6.95.

Book 5: Artificial-Light Photography, 116 pp., $6.95.

Zone Systemizer by J. J. Dowdell and R. D. Zakia. 63 pp., $8.95.

Workbook in Creative Photography by Josepha Haveman. 197 pp., $5.95.

Leica Manual: The Complete Book of 35mm Photography edited by Douglas O. Morgan, David Vestal, and William Broecker. 528 pp., 399 B&W photos, 16 pp. full color, $23.00.

Photo-Lab-Index 1975 edited by Ernest M. Pittaro. 1,202 pp., supplements issued quarterly, $35.00.

Color, Its Principles and Their Applications by F. W. Clulow. 236 pp., $14.00.

Exposure Control in Enlarging by George L. Wakefield. 195 pp., $8.95.

Illustrated Dictionary of Photography by Backhouse, Marsh, Tait, and Wakefield. 202 pp., $14.00.

Making and Printing Colour Negatives by John Vickers. 221 pp., $9.95.

Monobath Manual by Grant Haist. 168 pp., $7.95.

Photographic Chemistry by George T. Eaton. 124 pp., $5.95.

Photography in School by Robert Leggat. 200 pp., $14.95.

Polaroid Corporation, P.O. Box D, Boston, MA 02118 (A catalog of photographic equipment and accessories is available upon request.)

Scope Productions, Inc., P.O. Box 5515, Fresno, CA 93755

Photomechanical Film Series 100-0700

Roughs (100-0701)	5 films/$110.00
Comprehensives (100-0702)	
Paste-Ups (100-0703)	
Separation Overlay (100-0704)	
Lettering (100-0705)	
Photocopy Registration (100-0706)	5 films/$110.00
Line Negative (100-0707)	
Halftone Negative (100-0708)	
Copy Camera (100-0709)	
Artificial Lighting-Focusing (100-0710)	
	10 films/$210.00

ADDITIONAL SOURCES OF CAREER OPPORTUNITIES, INFORMATION, AND ASSISTANCE

American Association for Vocational Instructional Materials, Engineering Center, Athens, GA 30602

American Cinema Editors, 422 South Western Avenue, Los Angeles, CA 90020

American Industrial Arts Association, 1201 Sixteenth Street, NW, Washington, DC 20036

American Society of Photogrammetry, 105 North Virginia Avenue, Falls Church, VA 22046

American Society of Picture Professionals, P.O. Box 5283, Grand Central Station, New York, NY 10017

American Technical Education Association, North Dakota State School of Science, Wahpeton, ND 58075

American Vocational Association, Inc., 1510 H Street, NW, Washington, DC 20005

ASMP—The Society of Photographers in Communications, 60 East 42nd Street, New York, NY 10017

Biological Photographic Association, Box 1057, Rochester, MN 55901

Industrial Education Institute, 221 Columbus Avenue, Boston, MA 02116

Information Film Producers of America, Inc., 7080 Hollywood Boulevard, Suite 114, Hollywood, CA 90028

International Association of Independent Producers, P.O. Box 2801, Washington, DC 20013

National Academy of Television Arts and Sciences, 291 South LaCienega Boulevard, Beverly Hills, CA 90211

National Association of Industrial and Technical Teacher Educators, Kearney State College, Kearney, NE 68847

National Association of State Directors of Vocational Education, 2805 Eisenhower Street, Eau Claire, WI 54701

National Association of State Supervisors of Trade and Industrial Education, 1510 H Street, NW, Washington, DC 20005

National Employment Counselors Association, 1607 New Hampshire Avenue, NW, Washington, DC 20009

National Press Photographers Association, P.O. Box 1146, Durham, NC 27702

National Vocational Guidance Association, 1607 New Hampshire Avenue, NW, Washington, DC 20009

Photographic Administrators, Inc., 3 Provence Lane, Glen Head, NY 11545

Photographic Art and Science Foundation, 1100 Executive Way, Des Plaines, IL 60018

Society of Photographic Scientists and Engineers, 1330 Massachusetts Avenue, NW, Washington, DC 20005

Society of Photo-Technologists, P.O. Box 19308, Denver, CO 80219

University Photographers Association of America, Duke University, Durham, NC 27706

Vocational Industrial Clubs of America, 105 North Virginia Avenue, Falls Church, VA 22046

PART TWO

GUIDE FOR STUDENT SELECTION AND PLACEMENT IN THE TRAINING PROGRAM

SECTION 2.1

How to Use Part Two of the Guide

Part Two of the guide offers the school guidance counselor career information and recommends a set of steps that can be used to determine criteria for student selection and placement in the training program. The guidance counselor should become familiar with the sections presented in Part Two so that effective guidance activities, corresponding to the intent of the curriculum, can be carried out. In addition, Sections 1.2 and 1.3 of Part One are essential to the guidance process and should be reviewed by the guidance counselor.

STEP 1: Review how the guide was developed. Read Section 1.2, "How the Guide Was Developed," to gain a thorough understanding of the structure and development of the guide and to become familiar with these key concepts and terms: occupational analysis, career ladder, worker trait group, task statement, task inventory, and learning objective.

STEP 2: Review the information on the career field. Read Section 1.3, "General Job Description: Still Photographic Technician," for a comprehensive overview of the career field, descriptions of the type of work performed, employment forecasts, and other important career information.

STEP 3: Know the use and function of the Dictionary of Occupational Titles. If you have not already done so, you should become familiar with the use and function of the Dictionary of Occupational Titles and its supplements, which are available from the U.S. Department of Labor. These documents are the foundation upon which the still photographic technician aide training program and guidance activities are built.

STEP 4: Study the qualifications profile. Section 2.3, "Qualifications Profile for the Entry-Level Still Photographic Technician Aide," presents a composite profile of the entry-level worker and is based on the principal worker trait groups associated with the career field from the Dictionary of Occupational Titles. This profile can be used in preliminary screening activities and counseling students who want to enter the training program. Section 2.5, "Worker Trait Codification System," explains in full the knowledge, aptitude, and interest levels associated with these worker trait groups.

STEP 5: Determine the General Educational Development (GED) level of students. One part of the qualifications profile is a suggested level of competence related to general educational development. Section 2.2, "Career Guidance for Still Photographic Technician Aide Occupations," includes a description of the General Aptitude Test Battery (GATB) which can be used to determine the GED level of students as well as their aptitudes and interests.

STEP 6: Use the Advanced General Education Program for GED remediation. Section 2.4 provides a description and list of instructional units contained in the Advanced General Education Program. All or parts of this program can be used for remediation purposes based on the administration of the GATB.

STEP 7: Provide guidance for students who leave the program or who do not qualify. The results of the GATB, when used in conjunction with the qualifications profile, provide a useful starting point for counseling students who drop out of the program or whose interests, aptitudes, and GED level do not seem appropriate for the career field.

STEP 8: Coordinate your guidance activities with the instructor. Review the sections in Part One of the guide to gain an understanding of how the curriculum and instructional development activities correspond to the recommended guidance activities. Discuss student selection and placement activities with the instructor in order to better coordinate your efforts.

SECTION 2.2

Career Guidance for Still Photographic Technician Aide Occupations

Part Two of this guide is based on an extensive pool of career and job information maintained by the U.S. Employment Service and the Department of Labor. This and associated information is widely used by federal, state, and local governments, industry, private agencies, companies and institutions in hiring and placing workers and in defining worker duties, tasks, and activities.

By using Part Two in conjunction with the General Job Description (Section 1.3) and the Inventory of Job Tasks and Learning Objectives (Section 1.4), the guidance counselor will be able to:

- provide students with useful career decision-making information based on their interests, aptitudes, and previous educational experience.
- determine the General Educational Development (GED) level of individual students as it relates to the career field.
- determine the prerequisite learning needs of a student prior to his or her placement in the training program.

The guidance materials are a response to the many social factors which converge to stimulate interest in the career development needs of young people. All of these factors have in common the search for a set of values which will give meaning and usefulness to students' lives. Among the most important of these social factors are:

- the growing complexity in the occupational and organizational structure of society which makes it difficult for a person to assimilate and organize the data necessary to choose a career.
- the increasingly rapid rate of technological change which demands human adaptability and responsiveness.
- the increasing national concern for developing all human talent regardless of sex, age, religion, or ethnic origin.
- the need for specialized training to obtain entry-level jobs.
- the apparent disenchantment expressed by students who have difficulty relating their education to their lives.

The evolving view of a job is that it should be considered as one step in an integrated, life-long career. A job is a step on a career lattice involving both horizontal and vertical dimensions: horizontally, it involves a pattern of choices at one point in time; vertically, it involves choices over a period of time.

Career guidance should not be viewed as a static, tradition-based set of services that assists students in making simple occupational choices. Guidance must be developed from an initial assessment of the present and future career needs of students and must account for changes in the career field that could affect the development and fulfillment of students' expectations. The content of a guidance program can be organized in many ways to facilitate the student's development. Whatever its form, however, the program ultimately should encourage a student to assume responsibility for his or her own career development.

A career guidance program based on the counselor's experience, expertise, and use of the information presented here will help the student assimilate and integrate knowledge, experience, and appreciation related to the following career development efforts:

- self-understanding, which includes a person's relationships to his or her own characteristics and perceptions, to others, and to the society.

- an understanding of the world of work and those factors that affect its constant changing, including worker attitudes and disciplines.
- an understanding of the many factors to be considered in career planning.
- an understanding of the information and skills necessary to achieve self-fulfillment in work and leisure.

Section 2.2 is intended to facilitate the process of placing students in the training program. It provides techniques for determining the General Educational Development (GED) level of an individual and relating it to the GED level required for the job. Also presented is a description of the General Aptitude Test Battery, which can be used to determine students' aptitude and interest levels.

DEFINITION OF GENERAL EDUCATIONAL DEVELOPMENT*

General Educational Development (GED) can be defined as education of a general academic nature, ordinarily obtained in elementary school, high school, or college, which does not have a recognized, fairly specific occupational objective; this type of education also may be derived from experience or self-directed study. GED is composed of three types of development: reasoning, mathematical, and language.

Reasoning development involves the capacity to comprehend concepts and systems, solve problems, exercise judgment, and understand and carry out instructions, as well as to adapt to social and work environments.

Mathematical development is the acquisition of basic mathematical skills, not specifically vocationally oriented, such as solving arithmetic, algebraic, and geometric problems.

Language development includes the acquisition of language skills, not specifically vocationally oriented, such as mastery of an extensive vocabulary; use of correct sentence structure, punctuation, and spelling; and an appreciation of literature.

Mathematical and language development are "tool languages" which, although not specifically vocationally oriented, involve basic preparation for specific vocational goals. The descriptions of the various levels of language and mathematical development (see Section 2.5) are based on the curricula being taught at specified grade levels in schools throughout the country. An analysis of mathematics courses in the school curricula revealed distinct levels of progression in the primary and secondary grades and in college. These levels of progression facilitated the selection and assignment of six levels of GED for the mathematical development scale.

Though language courses follow a similar pattern of progression through completion of high school, consisting primarily of learning and applying the principles of grammar, this pattern breaks down at the college level. The diversity of fields of study at the college level precluded establishment of distinct levels of language development for these four years. Consequently, both GED Level 5 and Level 6 are defined by one language curriculum.

USING THE GED LEVELS FOR STUDENT PLACEMENT

In matching the student to the occupational program, it is essential to obtain all occupationally significant information about the student. Appraisal of the student in terms of his or her GED is based on such data as:

- school achievement, including grade level attained, subjects studied, standing in class, and honors or special recognition in specific subjects.
- special courses, either military or civilian.

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* Excerpted from "Relating General Educational Development to Career Planning," U.S. Dept. of Labor, Manpower Administration.

- results of tests which measure the degree of academic achievement or general intelligence.

- vocational and personal achievements in any previous work situations.

- general demeanor and ability to communicate.

These data can be related to an appropriate academic level on the GED chart in Section 2.5. For example, a student who has completed the eighth grade in school and achieved a B average in arithmetic, with C's and B's in other subjects, appears to be at an academic level which relates to GED Level 3.

If more information is needed to make a final determination, the guidance counselor can probe into the courses studied by the student to insure that the school curriculum meets the standards reflected in the curriculum for Level 3 on the GED chart. It should be remembered that a student sometimes has a higher educational development than his or her formal education presupposes, and in such a case he or she should be identified at a higher, more appropriate level.

The primary purpose of determining the GED level of a student is to provide a criterion for use with other information in relating him or her to suitable vocational goals, whether through immediate employment or through additional education and training. All information about the student—the evaluation of his or her aptitudes, interests, and personality characteristics, GED level, and any test results—can be related to areas of work, groups of jobs, and specific jobs in the Worker Traits Arrangement of the Dictionary of Occupational Titles. The most important information relating to still photographic technician aide occupations and worker trait groups is presented in Section 2.3. (A more detailed description of the worker trait codification system appears in Section 2.5.)

The qualifications profile in Section 2.3 includes the GED reasoning, mathematical, and language development levels required at the entry level. These GED levels indicate the degree of educational development, formal or otherwise, which the worker should possess for average satisfactory job performance. By relating the GED level of the student to that required for the career field, the guidance counselor can do a better job of helping students select vocational goals.

The subject matter areas listed in the GED chart in Section 2.5 can be used in planning basic or supplementary general education for students in the training program or advising a student on the educational basis required for functioning in this career field.

The GED levels listed in the qualifications profile in Section 2.3 constitute the prerequisites for effective job performance at the entry level. Should the prerequisite GED be missing in a candidate for the training program, then the student should be directed to a more appropriate program of occupational training.

If the student is selected for the training program on the basis of other criteria, then steps must be taken to provide him or her with academic training that will raise his or her GED to the desired level. Otherwise, the student will be handicapped in his or her ability to handle the course content of the training program and to perform the required duties and tasks while on the job.

A student who is deficient in prerequisite GED should be encouraged to participate in the Advanced General Education Program (see Section 2.4) either before becoming involved in training or during the training program.

GENERAL APTITUDE TEST BATTERY

Another useful tool in placing students in the training program is the General Aptitude Test Battery (GATB). The GATB was developed in conjunction with the occupational counseling services of the U.S. Employment Service. According to its developers, the GATB "is designed to measure several aptitudes which have been found important to success in many occupations." The battery is used primarily as an aid in the more effective placement of applicants who have insufficient job experience. Various state agencies, in cooperation with local school authorities, have been extending the application of the battery to the counseling of high school students.

The battery consists of 15 tests: 11 paper-and-pencil and four apparatus tests. It requires approximately 2½ hours for completion. The tests are designed to measure nine basic aptitudes for 20 fields of work including approximately 2,000 of the occupations classified in the Dictionary of Occupational Titles (D.O.T.). The nine aptitudes are: Intelligence (G), Numerical (N), Verbal (V), Spatial (S), Form Perception (P), Clerical Perception (Q), Motor Speed (T), Finger Dexterity (F), and Manual Dexterity (M).

The qualifications profile presented in Section 2.3 of this guide is derived from the D.O.T. and relates directly to the aptitudes measured in the GATB. For more information on obtaining, administering, and interpreting the results of the General Aptitude Test Battery, contact the local office of the Illinois State Employment Office.

SECTION 2.3

Qualifications Profile for the Entry-level Still Photographic Technician Aide

The qualifications profile contained in this section of the guide is based on an analysis of the essential worker traits for the occupation of still photographic technician aide. The analysis utilized the Dictionary of Occupational Titles and was supplemented by the Handbook for Analyzing Jobs and the Handbook on Relating General Educational Development to Career Planning. All three documents are publications of the U.S. Department of Labor. In addition, U.S. Civil Service Position Classification Standards manuals and U.S. Air Force job descriptions were utilized.

Worker traits are defined as the abilities, personal traits, and individual characteristics necessary for a worker to achieve average successful job performance. The qualifications profile provides the broadest and most comprehensive framework for the effective presentation of worker trait information in the career field.

This profile, and the job task and learning objective inventories developed around it (see Section 1.4), are seen as a natural basis upon which to select students for training and provide career counseling. Within this framework, the guidance counselor will find a qualifications profile which indicates:

- the amount of general educational development and specific vocational preparation a worker must have. .
- the specific capacities and abilities required of the worker in order to learn or perform certain tasks or duties.
- preferences for certain types of work activities or experiences considered necessary for job success.
- types of occupational situations to which an individual must adjust.
- physical activities required in work situations.
- physical surroundings prevalent in jobs.

All of this information can be used for placing students in or orienting them to the training program, when used in conjunction with the General Job Description (Section 1.3) and the Inventory of Job Tasks and Learning Objectives (Section 1.4).

QUALIFICATIONS PROFILE

The qualifications listed for successful performance as a still photographic technician aide are minimally acceptable standards of accomplishment necessary at that level.* (Section 2.5, "Worker Trait Codification System," presents a complete explanation of the levels and codification system used.)

The qualifications listed do not relate to performance requirements existing at higher levels within the career field. In order to progress within the field, the student must have the ability to attain higher-level capabilities through a combination of training and work experience so as to progress up the career ladder.

General Educational Development (GED) Requirements

Reasoning Development, Level 4:	Apply principles of rational systems to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists. Interpret a variety of instructions furnished in written, oral, diagrammatic, or schedule form.
Mathematical Development, Level 4:	Perform ordinary arithmetic, algebraic, and geometric procedures in standard, practical applications.
Language Development, Level 4:	Interpret technical manuals as well as drawings and specifications, such as layouts, blueprints, and schematics.

Specific Vocational Preparation (SVP) Requirements

Level 6:	Possesses training over one year up to and including two years so as to perform assigned duties in the organization, to gain knowledge and experience for promotion to next level positions. Observes techniques utilized by experienced workers, learns line and staff functions of each department, and becomes familiar with management policies and viewpoints as they affect each phase of operations.

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* It was necessary at times to update and/or modify the Department of Labor information in order to reflect new employment conditions and the realities of training. However, the basic organization and intent of the system developed by the Department of Labor and reflected in the Dictionary of Occupational Titles has been carefully followed. Critical commentary dealing with the development and utilization of the D.O.T. documents points to certain unavoidable limitations, as well as to strengths. An intent to avoid the former and take advantage of the latter underlies the development of the guide and accounts for the modifications of this information.

Aptitude (APT) Requirements

Intelligence (G), Level 3 Capability:	General learning ability. The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school.
Verbal (V), Level 3 Capability:	Ability to understand meanings of words and ideas associated with them, and to use them effectively. To comprehend language, to understand relationships between words, and to understand meanings of whole sentences and paragraphs. To present information or ideas clearly.
Numerical (N), Level 3 Capability:	Ability to perform arithmetic operations quickly and accurately.
Spatial (S), Level 3 Capability:	Ability to comprehend forms in space and understand relationships of plane and solid objects. Frequently described as the ability to "visualize" objects of two or three dimensions, or to think visually of geometric forms.
Form Perception (P), Level 2 Capability:	Ability to perceive pertinent detail in objects or in pictorial or graphic material. To make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.
Finger Dexterity (F), Level 3 Capability:	Ability to move the fingers and manipulate small objects with the fingers rapidly or accurately.
Color Discrimination (C), Level 3 Capability:	Ability to perceive or recognize similarities or differences in colors, or in shades or other values of the same color; to identify a particular color, or to recognize harmonious or contrasting color combinations, or to match colors accurately.

Interest (INT) Requirements

Factor 1: Situations involving activities dealing with things and objects.	is preferred over	**Factor 6:** Situations involving activities concerned with people and the communication of ideas.

Factor 7: Situations involving activities of a scientific and technical nature.	is preferred over	**Factor 2:** Situations involving activities of business contact with people.

Temperaments (TEMP) Requirements

Situation Type 1: Situations involving a variety of duties often characterized by frequent change.

Situation Type 2: Situations involving repetitive or short cycle operations carried out according to set procedures or sequences.

Situation Type Y: Situations involving the precise attainment of set limits, tolerances, or standards.

Physical Demands

Light physical demands associated with:

Factor 1: Lifting, Carrying, Pushing, and/or Pulling

Factor 6: Seeing (acuity, far and near; depth perception; accommodation; color vision)

Working Conditions

Work is performed inside under these conditions:

Condition 4: Wet and Humid

Condition 7: Fumes, Odors, Toxic Conditions

SECTION 2.4
The Advanced General Education Program

The Advanced General Education Program is designed to teach an individual the information, concepts, and general knowledge required to pass the American Council on Education's High School General Education Development (GED) Test. All students who enter a training program with, or who subsequently attain, qualifying scores on the Advanced Stanford Achievement Test should be encouraged to enter and complete this program if they do not have the prerequisite GED level required for effective performance in the training program. See Section 2.2 for information on determining the GED (General Educational Development) level of students.

The Advanced General Education Program provides comprehensive self-instruction in each of the following areas: correctness and effectiveness of expression, interpretation of literary materials, social studies, natural sciences, and general mathematics.

It should be stressed that the program is very comprehensive and will meet the learning needs of the vast majority of students who qualify for participation (those who have a sixth-grade mathematics and a sixth-grade reading ability as a minimum).

The program has been designed to require little routine teacher attention. Instructions for placement of materials are included in a teacher's manual along with detailed administrative directions. Once students have become familiar with this placement and with the procedures for taking the lessons and grading their own mastery tests, instructor assistance should be required only when students encounter difficulties they cannot themselves resolve and when progress is to be recorded.

The curriculum of the Advanced General Education Program is designed to provide the student with an educational background equivalent to that obtained in the typical high school course of studies, on which the standard high school achievement tests are based.

Emphasis in training is placed on learning concepts, rather than on the test-taking skills which are taught incidentally. The program prepares the student by improving his or her reading ability, increasing vocabulary, providing experience at interpretive tasks, and making him or her broadly familiar with the subject areas covered by the curriculum.

Flexible administration of the program has been accomplished in two primary ways: (1) lesson units do not take more than an hour to complete and (2) periodic screening tests enable the student to either by-pass material he or she may already know or to repeat materials that he or she did not learn sufficiently well. The time required to complete all of the lesson materials in the Advanced General Education Program averages 145 hours with a range of 90 to 230 hours.

Below is a complete listing of program materials in the Advanced General Education Program, which can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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* This section has been excerpted from "Advanced General Education Development—A High School Self-Study Program," U.S. Dept. of Labor, Manpower Administration, Job Corps.

TEACHER'S ADMINISTRATIVE MATERIALS

Teacher's Manual
Teacher's Answer Key
Progress Flow Chart

STUDENTS' INTRODUCTORY AND SELF-ADMINISTERED TEST MATERIALS

Student's Handbook
Screening Tests
Unit Tests
Students' Answer Keys

SEQUENCE OF LESSONS IN ADVANCED GENERAL EDUCATION PROGRAM

Level I

Unit 1: Word Roots, Prefixes, Suffixes
Word Context Clues

Unit 2: Map Reading Skills
Climate
Studying Man and the Natural World
Man and His Culture
Reading for Implied Meanings

Unit 3: Production and Consumption
Forms of Government
Reading for Facts, Opinions, and Issues

Unit 4: Basic Economic Systems
Representative Democracy and Political Parties
Reading to Draw Inferences

Unit 5: Craftsmanship and Technology
Government Separation of Powers
Comparisons in Literature

Unit 6: Positive and Negative Numbers
States of Matter: Solid, Liquid, Gas
Properties and Measures of Matter
Energy, Matter, Theory and Law
The Particles and Structure of Matter

Unit 7: Atomic Structure and Chemical Change
Chemical Compounds
Forms of Energy

Unit 8: Solving Fraction Word Problems
Solving Decimal Word Problems
Solving Percentage Word Problems

Level II

Unit 1: Tables and Graphs
Line Graphs

Unit 2: U.S. Colonization to Independence
U.S. Confederation to Constitutional Convention
Framing the U.S. Constitution
Founding Fathers
The Election Process
The Civil War

Unit 3: Industrialization and Growth of the Cities
Immigration
Unions and Management

Unit 4: Reading for Feelings
Reading for Shifts in Feeling
Reading for Character
Reading for Signs of Hidden Character

Unit 5: Words that Paint Pictures
Devices Used in Literature
The Meaning of Literary Devices
Periods and Levels of Writing
Qualities of Good and Bad Writing

Unit 6: What to Look for in Narrative Writing
Interpreting Figurative Writing
Keeping Track of the Subject in Writing
Reading Literature for Understanding

Unit 7: Life Functions and Cells
Cell Structure
Tissues, Organs, Systems
Growth and Nutrition
Metabolism

Unit 8: Algebra
Powers and Roots
Geometry
Number Series

Unit 9: Speed, Acceleration, and Velocity
Force, Mass, and Distance
Types of Motion and Rest
Electricity and Magnetism
Electrical, Magnetic, and Gravitational Fields
The Conservation and Conversion of Energy
Simple Machines and Work
Gas Laws
Principles of Heat Engines
Sound and Sound Waves
Light Waves and Particles
The Behavior of Light Rays

Unit 10: Atomic Structure and Valence
Chemical Bonding
The Table of Elements
Electrolysis
Osmosis

Level III

Unit 1: Free Enterprise and Government Regulation
Social Legislation
Taxes

Unit 2: Free Trade and Tariffs
Capitalism, Communism, Socialism
Nationalism vs. Internationalism

Unit 3: Plants and Photosynthesis
The Human Digestive System
Functions of the Blood
Human Circulation and Respiration
Reproduction of a Single Cell
Reproduction by Male and Female Cells
The Human Reproductive System
Genetics and Heredity
The Nervous System
The Glandular System

Unit 4: Difficult Words to Spell
Sentences and Their Parts
Adjectives and Adverbs
Comparative Forms
Spelling ie and ei Words
Using Negatives Correctly
Using Prepositions and Prepositional Phrases
Spelling ance and ence Words
Subject and Object Pronouns
Possessive and Reflexive Pronouns
Possessive and Plural Nouns
Spelling Confusing Word Pairs
Subject and Verb Agreement
Past Verb Forms
Spelling More Difficult Words

Unit 5: Spelling Endings Added to e
Capitalization
Question Marks and Exclamation Points
Quotation Marks
Spelling Double Letter Demons
Colons and Dashes
Punctuating Series with Commas and Semicolons
More Confusing Word Pairs
Separating Sentence Parts with Punctuation
Other Uses for Commas and Semicolons
More Special Spelling Problems

Unit 6: Spelling More Endings
Matching Sentence Parts
Using the Right Sentence Connectives
More Ways to Make Sentences Effective
Last of the Confusing Word Pairs

SECTION 2.5
Worker Trait Codification System

Worker traits can be defined as those abilities, personal traits, and individual characteristics required for a worker to achieve average successful job performance. This section provides detailed explanations of these worker traits and their levels: General Educational Development, Specific Vocational Preparation, Aptitudes, Interests, Temperaments, and Physical Demands.

This section also provides an explanation of the last three digits of the occupational code numbers used in the *Dictionary of Occupational Titles*: namely, the relationship of any particular job to Data, People, and Things. All of the information in Section 2.5 has been excerpted from Appendices A and B of the *Dictionary of Occupational Titles, Volume II*.

GENERAL EDUCATIONAL DEVELOPMENT (GED)

General Educational Development embraces the aspects of education, both formal and informal, which contribute to the worker's reasoning development, ability to follow instructions, and acquisition of "tool" knowledges such as language and mathematical skills. It is education of a general nature which does not have a recognized, fairly specific, occupational objective. Ordinarily such education is obtained in elementary school, high school, or college. It also derives from experience and from individual study. The table on the next page explains the various levels of General Educational Development.

SPECIFIC VOCATIONAL PREPARATION (SVP)

Specific Vocational Preparation includes the amount of time required to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation. This training may be acquired in a school, work, military, institutional, or avocational environment. It does not include the orientation training required of every fully qualified worker to become accustomed to the special conditions of any new job. Specific Vocational Preparation includes training given in any of the following circumstances:

- vocational education such as high school commercial or shop training, technical school, art school, and that part of college training which is organized around a specific vocational objective.
- apprentice training, for apprenticeable jobs only.
- in-plant training given by an employer in the form of organized classroom study.
- on-the-job training under the instruction of a qualified worker.
- essential experience in other, less responsible jobs which lead to the higher-level job, or serving in other jobs which qualify.

GENERAL EDUCATIONAL DEVELOPMENT

Level	Reasoning Development	Mathematical Development	Language Development
6	Apply principles of logical or scientific thinking to a wide range of intellectual and practical problems. Deal with non-verbal symbolism (formulas, scientific equations, musical notes, graphs, etc.) in its most difficult phases. Deal with a variety of abstract and concrete variables. Apprehend the most abstruse classes of concepts.	Apply knowledge of advanced mathematical and statistical techniques such as differential and integral calculus, factor analysis, and probability determination, or work with a wide variety of theoretical mathematical concepts and make original applications of mathematical procedures, as in empirical and differential equations.	Comprehension and expression of a level to: • Report, write, or edit articles for such publications as newspapers, magazines, and technical or scientific journals. • Prepare and deliver lectures on politics, economics, education, or science. • Interview, counsel, or advise such people as students, clients, or patients in such matters as welfare eligibility, vocational rehabilitation, mental hygiene, or marital relations.
5	Apply principles of logical or scientific thinking to define problems, collect data, establish facts, and draw conclusions. Interpret an extensive variety of technical instructions in books, manuals, and mathematical or diagrammatic form. Deal with several abstract and concrete variables.		
4	Apply principles of rational systems to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists. Interpret a variety of instructions furnished in written, oral, diagrammatic, or schedule form.	Perform ordinary arithmetic, algebraic and geometric procedures in standard, practical applications.	Comprehension and expression of a level to: • Transcribe dictation, make appointments for executive and handle personal mail, interview and screen people, and write routine correspondence on own initiative. • Interview job applicants to determine work best suited for their abilities and experience, and contact employers to interest them in services of agency. • Interpret technical manuals as well as drawings and specifications, such as layouts, blueprints, and schematics.
3	Apply common sense understanding to carry out instructions furnished in written, oral, or diagrammatic form. Deal with problems involving several concrete variables in or from standardized situations.	Make arithmetic calculations, involving fractions, decimals, and percentages.	Comprehension and expression of a level to: • File, post, and mail such material as forms, checks, receipts, and bills. • Copy data from one record to another, fill in report forms, and type all work from rough draft or corrected copy. • Interview members of household to obtain such information as age, occupation, and number of children, to be used as data for surveys or economic studies. • Guide people on tours through historical or public buildings, describing such features as size, value, and points of interest.
2	Apply common sense understanding to carry out detailed but uninvolved written or oral instructions. Deal with problems involving a few concrete variables in or from standardized situations.	Use arithmetic to add, subtract, multiply, and divide whole numbers.	
1	Apply common sense understanding to carry out simple one- or two-step instructions. Deal with standardized situations with occasional or no variables in or from these situations encountered on the job.	Perform simple addition and subtraction, reading and copying of figures, or counting and recording.	Comprehension and expression of a level to: • Learn job duties from oral instructions or demonstration. • Write identifying information, such as name and address of customer, weight, number, or type of product, on tags or slips. • Request orally or in writing such supplies as linen, soap, or work materials.

The following table describes the nine levels of Specific Vocational Preparation:

Level	Time
1	Short demonstration only
2	Anything beyond short demonstration up to and including 30 days
3	Over 30 days up to and including three months
4	Over three months up to and including six months
5	Over six months up to and including one year
6	Over one year up to and including two years
7	Over two years up to and including four years
8	Over four years up to and including 10 years
9	Over 10 years

APTITUDES (APT)

The five-point scale below indicates how much of each aptitude the job requires for satisfactory or average performance. The average requirements, rather than a maximum or minimum, are cited. The amount required is expressed in terms of equivalent amounts possessed by segments of the general working population. The five-point scale is as follows:

1 = The top 10 percent of the population. This segment of the population possesses an extremely high degree of the aptitude.

2 = The highest third exclusive of the top 10 percent of the population. This segment of the population possesses an above-average or high degree of the aptitude.

3 = The middle third of the population. This segment of the population possesses a medium degree of the aptitude, ranging from slightly above to slightly below average.

4 = The lowest third exclusive of the bottom 10 percent of the population. This segment of the population possesses a below-average or low degree of the aptitude.

5 = The lowest 10 percent of the population. This segment of the population possesses a negligible degree of the aptitude.

This scale can be applied to each of the 11 aptitudes below to indicate the amount required for a particular job or task. The code letters used to designate each aptitude are in parentheses.

DESCRIPTION OF APTITUDES

Intelligence (G): General learning ability. The ability to "catch on" or understand instructions and underlying principles. Ability to reason and make judgments. Closely related to doing well in school.

Verbal (V): Ability to understand meanings of words and ideas associated with them, and to use them effectively. Ability to comprehend language, to understand relationships between words, and to understand meanings of whole sentences and paragraphs. Ability to present information or ideas clearly.

Numerical (N): Ability to perform arithmetic operations quickly and accurately.

Spatial (S): Ability to comprehend forms in space and understand relationships of plane and solid objects. May be used in such tasks as blueprint reading and in solving geometry problems. Frequently described as the ability to "visualize" objects of two or three dimensions, or to think visually of geometric forms.

Form Perception (P): Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.

Clerical Perception (Q): Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation.

Motor Coordination (K): Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and quickly.

Finger Dexterity (F): Ability to move the fingers and to manipulate small objects with the fingers rapidly or accurately.

Manual Dexterity (M): Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.

Eye-Hand-Foot Coordination (E): Ability to move the hand and foot coordinately with each other in accordance with visual stimuli.

Color Discrimination (C): Ability to perceive or recognize similarities or differences in colors, or in shades or other values of the same color. Ability to identify a particular color, or to recognize harmonious or contrasting color combinations, or to match colors accurately.

INTERESTS (INT)

This worker trait component involves preferences for certain types of work activities or experiences, with accompanying rejection of contrary types of activities or experiences. Five pairs of interest factors are provided so that a positive preference for one factor of a pair also implies rejection of the other factor of that pair.

1	Situations involving a preference for activities dealing with things and objects.	vs.	6	Situations involving a preference for activities concerned with people and the communication of ideas.

2	Situations involving a preference for activities involving business contact with people.	vs.	7	Situations involving a preference for activities of a scientific and technical nature.
3	Situations involving a preference for activities of a routine, concrete, organized nature.	vs.	8	Situations involving a preference for activities of an abstract and creative nature.
4	Situations involving a preference for working with people for their presumed good, as in the social welfare sense, or for dealing with people and language in social situations.	vs.	9	Situations involving a preference for activities that are nonsocial in nature, and are carried on in relation to processes, machines, and techniques.
5	Situations involving a preference for activities resulting in prestige or the esteem of others.	vs.	0	Situations involving a preference for activities resulting in tangible, productive satisfaction.

TEMPERAMENTS (TEMP)

Temperaments refer to different types of occupational situations to which workers must adjust.

1 Situations involving a variety of duties often characterized by frequent change.

2 Situations involving repetitive or short cycle operations carried out according to set procedures or sequences.

3 Situations involving doing things only under specific instruction, allowing little or no room for independent action or judgment in working out job problems.

4 Situations involving the direction, control, and planning of an entire activity or the activities of others.

5 Situations involving the necessity of dealing with people in actual job duties beyond giving and receiving instructions.

6 Situations involving working alone and apart in physical isolation from others, although the activity may be integrated with that of others.

7 Situations involving influencing people in their opinions, attitudes, or judgments about ideas or things.

8 Situations involving performing adequately under stress when confronted with the critical or unexpected or when taking risks.

9 Situations involving the evaluation (arriving at generalizations, judgments, or decisions) of information against sensory or judgmental criteria.

0 Situations involving the evaluation (arriving at generalizations, judgments, or decisions) of information against measurable or verifiable criteria.

X Situations involving the interpretation of feelings, ideas, or facts in terms of personal viewpoint.

Y Situations involving the precise attainment of set limits, tolerances, or standards.

PHYSICAL DEMANDS (PHYS DEM)

Physical demands are those physical activities required of a worker in a job. The physical demands referred to serve as a means of expressing both the physical requirements of the job and the physical capacities (specific physical traits) a worker must have to meet the requirements. For example, "seeing" is the name of a physical demand required by many jobs (perceiving by the sense of vision), and also the name of a specific capacity possessed by many people (having the power of sight). The worker must possess physical capacities at least in an amount equal to the physical demands made by the job.

FACTOR 1: Lifting, Carrying, Pushing, and/or Pulling (Strength)

These are the primary "strength" physical requirements, and generally speaking, a person who engages in one of these activities can engage in all. Specifically, each of these activities can be described as:

Lifting: Raising or lowering an object from one level to another (includes upward pulling).

Carrying: Transporting an object, usually holding it in the hands or arms or on the shoulder.

Pushing: Exerting force upon an object so that the object moves away from the force (includes slapping, striking, kicking, and treadle actions).

Pulling: Exerting force upon an object so that the object moves toward the force (includes jerking).

The five degrees of Factor 1: Lifting, Carrying, Pushing, and/or Pulling are as follows:

Sedentary Work (S) = Lifting 10 lbs. maximum and occasionally lifting and/or carrying such articles as dockets, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

Light Work (L) = Lifting 20 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 10 lbs. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree, or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

Medium Work (M) = Lifting 50 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 25 lbs.

Heavy Work (H) = Lifting 100 lbs. maximum with frequent lifting and/or carrying of objects weighing up to 50 lbs.

Very Heavy Work (V) = Lifting objects in excess of 100 lbs. with frequent lifting and/or carrying of objects weighing 50 lbs. or more.

FACTOR 2: Climbing and/or Balancing

Climbing: Ascending or descending ladders, stairs, scaffolding, ramps, poles, ropes, and the like, using the feet and legs and/or hands and arms.

Balancing: Maintaining body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery, or erratically moving surfaces; or maintaining body equilibrium when performing gymnastic feats.

FACTOR 3: Stooping, Kneeling, Crouching, and/or Crawling

Stooping: Bending the body downward and forward by bending the spine at the waist.

Kneeling: Bending the legs at the knees to come to rest on the knee or knees.

Crouching: Bending the body downward and forward by bending the legs and spine.

Crawling: Moving about on the hands and knees or hands and feet.

FACTOR 4: Reaching, Handling, Fingering, and/or Feeling

Reaching: Extending the hands and arms in any direction.

Handling: Seizing, holding, grasping, turning, or otherwise working with the hand or hands (fingering not involved).

Fingering: Picking, pinching, or otherwise working with the fingers primarily (rather than with the whole hand or arm as in handling).

Feeling: Perceiving such attributes of objects and materials as size, shape, temperature, or texture, by means of receptors in the skin, particularly those of the fingertips.

FACTOR 5: Talking and/or Hearing

Talking: Expressing or exchanging ideas by means of the spoken word.

Hearing: Perceiving nature of sounds by the ear.

FACTOR 6: Seeing

Obtaining impressions through the eyes of the shape, size, distance, motion, color, or other characteristics of objects. The major visual functions are defined as follows:

Acuity, Far: Clarity of vision at 20 feet or more.

Acuity, Near: Clarity of vision at 20 inches or less.

Depth Perception: Three-dimensional vision. The ability to judge distance and space relationships so as to see objects where and as they actually are.

Field of Vision: The area that can be seen up and down or to the right or left while the eyes are fixed on a given point.

Accommodation: Adjustment of the lens of the eye to bring an object into sharp focus. This item is especially important when doing near-point work at varying distances from the eye.

Color Vision: The ability to identify and distinguish colors.

DATA, PEOPLE, AND THINGS

The last three digits of an occupational code number express the job's relationship to Data, People, and Things. Only relationships which are significant in terms of job requirements are reflected in the code numbers. The incidental relationships which every worker has to Data, People, and Things, but which do not seriously affect successful performance of the essential duties of the job, are not reflected. Each successive relationship includes those that are simpler.

DATA (4th digit)	**PEOPLE** (5th digit)	**THINGS** (6th digit)
0 Synthesizing	0 Mentoring	0 Setting Up
1 Coordinating	1 Negotiating	1 Precision Working
2 Analyzing	2 Instructing	2 Operating-Controlling
3 Compiling	3 Supervising	3 Driving-Operating
4 Computing	4 Diverting	4 Manipulating
5 Copying	5 Persuading	5 Tending
6 Comparing	6 Speaking-Signalling	6 Feeding-Offbearing
7 No significant relationship	7 Serving	7 Handling
8 No significant relationship	8 No significant relationship	8 No significant relationship

SECTION 2.6

Related Jobs at Entry, Intermediate, and Advanced Levels

This section is intended primarily for use in career guidance activities. Persons trained as still photographic technician aides will acquire skills and knowledge which provide job and career mobility across a broad range of occupations. The following list of job descriptions, as a partial compilation, illustrates the career flexibility possible given continued training or a minimum amount of retraining. The job titles and code numbers have been drawn from the Dictionary of Occupational Titles, where a complete listing of related jobs can be found. (See related job titles accompanying each job description.)

To be used effectively, this list should be matched against the Inventory of Job Tasks and Learning Objectives (Section 1.4), which has been structured by job levels (entry, intermediate, and advanced) within the career ladder. Guidance counselors, instructors and students, as well as employers, recruiting officers, placement and personnel directors, and others within education and industry should find these descriptions of much value.

AERIAL PHOTOGRAPHER (professional and kindred occupations) D.O.T. 143.381

Photographs sites from airplanes in flight for news, scientific, or military purposes. Calculates number of exposures and time lapse between them required to obtain picture. Loads camera with film and mounts it on camera mount or on any convenient part of airplane. Follows plotted course on map indicating altitude and area to be covered. Adjusts exposure time. Keeps camera level and oriented in flight path, constantly adjusting it as necessary. Attaches automatic exposure mechanism to camera and adjusts it for timed exposures, or manually trips shutter at calculated intervals. May prepare solutions and chemicals used in developing films and printing positives. May match individual photographs for terrain map.

COMMERCIAL PHOTOGRAPHER (professional and kindred occupations) D.O.T. 143.062

Also see job description for: **still cameraman**

Photographs persons, motion-picture sets, merchandise, exteriors and interiors, machinery, and fashions to be used in advertising and selling. Arranges equipment, such as lighting, screens, and shades, and moves objects, such as backdrops and props, to obtain desired effects. Loads film in film holders. Sets camera for correct angle and distance, adjusts lens for focus, and places negative plate in camera. Removes slide from plate, and squeezes lens-shutter bulb to open lens shutter and expose plate. Mixes solutions and chemicals used in developing plates and films and printing positives. Enlarges, reduces, and intensifies prints. May take portraits.

COMMERCIAL PHOTOGRAPHER APPRENTICE (professional and kindred occupations) D.O.T. 143.062

Also see job description for: **still-cameraman apprentice**

Performs duties as described under apprentice.

IDENTIFICATION BUREAU PHOTOGRAPHER (government service) D.O.T. 143.382

Also see job description for: **police photographer**

Photographs persons suspected or convicted of crimes for identification purposes. Photographs scene of crimes to prepare photographic record of perishable evidence for prosecuting case, according to knowledge of photographic techniques. May develop, print, and enlarge negatives.

LITHOGRAPHIC PHOTOGRAPHER (printing and publishing) D.O.T. 972.382

Also see job descriptions for: **cameraman, copy cameraman, lithographic cameraman, stone photographer, wet plate photographer, photolithographer, photolithographic process man, process man**

Sets up and operates camera to photograph illustrations and printed material to produce film or glass negatives, or reversed negatives used in the preparation of lithographic printing plates. Mounts material to be photographed on copy board and focuses camera to enlarge or reduce size of object in photograph. Selects and places screen over negative to break up shadings in object for halftone printing. Places color filters over film to produce four-color separation, halftone separation, and process prints for multicolor printing. Focuses lens, adjusts lights, and exposes film to copy for specified period of time. Develops and dries film or glass plate. Prepares film or glass plate positives by contact method from negatives. May prepare original layouts for halftone or color prints by copy-drawing, pasteup, stripping, or inking techniques.

NEWS PHOTOGRAPHER (printing and publishing) D.O.T. 143.062

Also see job descriptions for: **cameraman, newspaper photographer**

Photographs news events or people for use in illustrating news stories and articles. Travels to assigned location and takes pictures, using camera. Returns to newspaper office with exposed plates, develops negatives, and prints pictures for use in making printing plates to reproduce picture. Keeps files of negatives or pictures for future use. May make enlargements of illustrative material secured by reporters. Frequently specializes in one branch of work, such as news, sports, special features, or portrait photography.

PHOTO CHECKER AND ASSEMBLER (any industry) D.O.T. 976.687

Also see job descriptions for: **finisher, proofer**

Inspects, assembles, and packs mounted or unmounted negatives, color film transparencies, and photographic prints. Examines items for natural color shading, density, sharpness of image, or identifying numbers, using lighted viewing screen. Marks defective prints, using grease pencil and standardized symbols to indicate nature of defect and corrective action required in reprinting. Packages and labels satisfactory prints and negatives. May cut negatives and prints from roll, using cutting machine. May be designated according to type of print inspected as color-print inspector, full-roll inspector, mounting inspector, or reversal-print inspector. May inspect prints for tears, dirt, scum, or other surface defects preparatory to mounting, and be designated take-down inspector.

PHOTOCOMPOSING-MACHINE OPERATOR (printing and publishing) D.O.T. 650.782

Also see job description for: **typesetter**

Sets up and operates photocomposing machine to transfer data from perforated tape into print on film or photographic paper. Loads roll of film or paper in machine magazine. Secures roll of perforated tape on machine reel and threads end of tape through machine feed rollers. Selects type font according to size and face of type specified and positions it on photographic unit. Turns dials to adjust line spacing and light intensity according to size and face of type. Starts machine that automatically prints type onto film or paper according to coded signal on tape. Removes finished copy from magazine for development.

PHOTOENGRAVER (printing and publishing) D.O.T. 971.381

Also see job descriptions for: **engraving operator, photolith operator**

Photographs copy, develops negatives, and prepares photosensitized metal plates, such as copper, zinc, aluminum, and magnesium, for use in printing. Positions copy on copy board of darkroom camera and exposes film to copy. Fastens scoured metal plate to whirling machine table or suspension hooks, pours photosensitizing solution on plate, and starts machine which rotates plate to distribute and dry solution evenly over its surface. Exposes negative and plate to bright light in vacuum type printing frame to transfer image to plate. Rolls ink onto exposed plate and washes unexposed and unfixed emulsion from plate with running water and cotton pad to expose bare metal. Places developed plate in acid bath or etching machine to erode unprotected metal to specified depth. Mounts etched plates on wood blocks with nails or metal base with thermosetting adhesive to raise printing surface type high. Removes excess metal from nonprinting areas of cut, using routing machine. Cuts mortices in mounted plates, using power drill and jigsaw, to insert type or other cuts. Modifies and repairs finished plates, using engravers' handtools, etching brush, and acid. May be designated according to type of plate made as plate maker, zinc.

PHOTOENGRAVING ETCHER (printing and publishing) D.O.T. 971.381

Also see job descriptions for: **copper etcher, zinc etcher, photoengraver**

Etches metal printing plates to remove metal from nonprinting areas, according to art copy. Mixes solutions of corrosive chemicals, such as acid and caustic chemicals, to suit zinc, magnesium, or copper photographically printed plates used in printing line and halftone illustrations. Brushes acid resisting solution on back and edges of plate to protect it during etching process. Mounts plate in etching machine and starts machine which sprays acid or caustic solution against plate to eat away areas of metal not protected by printed emulsion or resist. Removes plate from machine before acid starts eating metal under printed design. Washes and dries plate. Brushes acid-resisting powder on design and bakes over gas plate. Returns plate to machine for further etching. Repeats resist coating of plate and re-etching until printing depth is attained. Measures depth with depth gage. Balances color values of each of several plates for multicolor reproduction to match original (art work) medium according to knowledge of printing plates. Washes and scrubs etched plate with caustical solution and brush to remove photographic image and resist, rinses, and wipes dry with chamois.

PHOTOENGRAVING FINISHER (printing and publishing) D.O.T. 971.381

Also see job descriptions for: **finisher, photoengraving plate finisher**

Blocks out, re-etches, or intensifies designs to refine or repair copper, zinc, aluminum, and magnesium photoengraved printing plates according to copy and specifications, using artist's brushes and hand engraving and burnishing tools. Applies chalk to engraved surface and examines cut under magnifying glass to detect damaged halftone dots and evaluate quality of etching against copy. Outlines images, cuts border, blocks out backgrounds, and raises halftone dots, using engraving tools. Burnishes high halftone dots to correct defects in printing quality and contrast of cut, using burnishing tools. Repairs breaks in type with handtools. Re-etches or engraves plates to correct tone values in series of color process cuts. May re-etch design on plates to intensify them. May make proofs of completed monochrome and multicolor plates.

PHOTOENGRAVING PHOTOGRAPHER (printing and publishing) D.O.T. 971.382

Also see job descriptions for: **cameraman, engraving photographer**

Sets up and operates camera to photograph drawings, sketches, or other material to produce negatives for transfer to printing plates or rollers. Mounts copy on holder, alining centerline on copy with centerline on holder. Studies copy and order sheet to determine photographic techniques required to transfer desired effect onto film, according to plate or roller dimensions, type of design, colors in design, and engraving requirements. Computes camera settings required to reproduce sketch to specified scale according to dimensions of printing plates or rollers. Focuses camera, compensating for differences in size and distortions in copy. Measures opening in back of camera to verify settings, using steel tape. Positions film on vacuum board, closes board against back of camera, and locks board in position. Arranges arc lamps for even distribution of light and exposes film for specified length of time. Removes exposed film from camera and develops film in series of developing, rinsing, and fixing baths. Compares developed film with design to determine whether desired effect has been reproduced. Hangs film on line to dry. When producing negatives for halftone printing, inserts screen in front of film to reduce copy to dots for reproduction. May process sensitized metal plates for subsequent etching.

PHOTOGRAPH FINISHER (any industry) D.O.T. 976.886

Also see job description for: **print finisher, photograph mounter**

Performs any combination of tasks involved in drying, trimming, and mounting photographic prints. Places washed print on conveyor or leading to heated rotating cylinder that dries and flattens print. Trims print edges, using paper cutter. Mounts print in specified frame or on material, such as paper, cardboard, or fabric, using cement or hand-operated press. Inserts print and corresponding negative in customer envelope. Computes price of order, according to size and number of prints, and marks price on customer envelope.

PHOTOGRAPH RETOUCHER (any industry) D.O.T. 970.281

Also see job description for: **photograph finisher-retoucher**

Retouches photographic negatives and prints to accentuate desirable features of subject, using pencils or watercolors and brushes. Examines negative to determine which features should be accented or minimized. Paints negative with retouching medium so that retouching pencil will mark surface of negative. Shades negative with pencil to smooth facial contours, conceal stray hairs, wrinkles, or blemishes, and soften harsh highlights. Brushes watercolors on print to accentuate lights and shadows and produce clear and attractive features.

PHOTOGRAPHER HELPER (any industry) D.O.T. 976.887

Assists commercial photographer in taking and developing photographs. Arranges lights and screens, sets up camera at proper angle, and moves objects to secure desired background for photographs as directed. Assists in darkroom duties, such as mixing chemical solutions and developing films. May label photographs. Performs other duties as described under helper.

PHOTOGRAPHIC ENGINEER (professional and kindred occupations) D.O.T. 019.081

Also see job description for: **photographic technologist**

Designs and constructs photographic equipment and materials, and solves problems concerning industrial and scientific processes and phenomena by using photographic techniques. Plans setup of equipment and controlled procedure to meet unusual situations. Possesses a technical background in mechanical or chemical engineering and other fields and, in addition, photographic ability. May act as consultant to organizations concerned with problems in fields, such as aerodynamics, ballistics, biology, engineering, and metallurgy.

PHOTOGRAPHIC FOREMAN (printing and publishing) D.O.T. 976.131

Also see job description for: **photographic section chief**

Supervises and coordinates activities of workers engaged in reproduction of positive or negative copies of maps, charts, or other documents by photochemical process. Performs duties as described under foreman.

PHOTOGRAPHIC-MACHINE OPERATOR (clerical) D.O.T. 207.885

Also see job description for: **microphotographer**

Tends equipment that photographs original documents and records, such as deeds, bills, statements, vouchers, and checks. Loads equipment with reel of film. Feeds records to be photographed into feed rolls that carry material past camera lens to be photographed. May be designated according to trade name of equipment operated as Dexigraph operator; Recordak operator.

PHOTOGRAPHIC-PLATE MAKER (electronics) D.O.T. 714.381

Also see job description for: **photographic-process attendant**

Prepares photographic plates used to print pattern of aperture masks on sensitized steel. Examines unexposed plate to detect foreign particles or emulsion flaws. Transfers image from master plate to unexposed plate by means of contact exposure and immerses plate in series of chemical and water baths to develop image on plate. Examines plate over light box in darkroom to detect flaws and verify conformity of pattern with master plate. Measures dot size and center distance, using calibrated microscope, and examines master and production plates for dot damage. Repairs defective plates by filling in missing dots, using photographic touch-up tool and ink. Installs and alines plates in printing chase for printing-chase operator. Prepares developing solutions, following formula.

PHOTOGRAPHIC SENSITOMETRIST (motion picture) D.O.T. 976.381

Also see job description for: **sensitometrist**

Determines such characteristics of photographic emulsions as their speed, contrast, and maximum density. Exposes photographic material to light under standardized conditions, usually in an instrument known as a sensitometer. Processes exposed material according to a rigidly prescribed technique. Determines the photographic density (resistance to passage of light) corresponding to each intensity of exposure, usually with an instrument known as a densitometer. Computes photographic characteristics from data so obtained.

PHOTOLETTERING-MACHINE OPERATOR (printing and publishing) D.O.T. 652.885

Also see job description for: **typesetter**

Tends photolettering machine that photographically prints display type and headings onto film or photographic paper. Secures roll of film or paper in machine magazine. Inserts specified film fonts in machine reel. Turns reel to specified selector mark to position letters to be printed and depresses lever to expose specified letter on film or paper. Pushes cutter button to separate finished proofs from roll of film or paper. Removes finished copy from magazine for development.

PHOTOLITH OPERATOR (any industry) D.O.T. 979.887

Also see job description for: **photoengraver**

Makes working copies of tracings, using continuous printing machine that makes negative and positive prints by contact exposure. Places sensitized film against tracing in printing machine and starts machine and arc lights to expose negative. Develops negatives or prints by immersing them in chemical baths, washing off chemicals with water, and hanging up negatives or prints to dry. May block out parts on original tracings by painting out lines with opaque covering.

MINIATURE PHOTO-MACHINE OPERATOR (personal services) D.O.T. 143.867

Also see job descriptions for: **automatic miniature cameraman, photo-booth boy or girl, automatic miniature photographer, photomation-machine operator**

Photographs patrons, using prefocused camera, to take series of miniature pictures. Seats and poses patron in lighted booth. Presses button that releases shutter of camera to take photograph. Turns crank to advance film for next photograph. Cuts exposed film from roll, using knife, and develops positive film in darkroom. Collects payment for finished photographs. May enlarge pictures. May tint pictures, using oils or watercolors.

PHOTOPRINT CHECKER (clerical) D.O.T. 222.588

Verifies print numbers against envelope to insure delivery to correct customer. Examines prints and returns underdeveloped prints to darkroom for reprocessing. Prices orders and marks price on envelope.

PHOTORADIO OPERATOR (telephone and telegraph) D.O.T. 193.382

Also see job descriptions for: **facsimile operator, radio-photo technician**

Operates electronic equipment to transmit and receive radio photographs and repairs equipment. Mounts photographs or printed matter on cylinder and secures with gripper bar. Turns dials to set frequency controls. Starts equipment that scans material and converts light and dark areas into electrical impulses for transmission. Communicates with receiving operator to give and receive instructions for transmission. Positions negative on cylinder, sets controls, and listens for signals to receive transmission. Develops negatives, prints photographs, and keeps log of transmissions. Maintains and repairs electronic equipment, such as wire circuits, dials, and gages, using schematic diagram, handtools, and test instruments. Reruns transmission when photograph is substandard. May send or receive Morse code messages when voice communication is not possible. Must possess Federal Communication Commission operator's license.

PHOTOSTAT OPERATOR (any industry)
D.O.T. 979.382

Also see job descriptions for: **photocopy operator, photostat-machine operator**

Sets up and operates photostat machine to duplicate printed material, such as manuscripts. Places roll of sensitized paper in machine. Measures length and width of material to be copied, using rule. Computes percentage of enlargement or reproduction necessary, using chart or percentage scale. Mounts material on easel beneath lens, turns on light, and moves controls to focus lens on material. Estimates exposure time, according to size of lens aperture, grade of sensitized paper, and intensity of light. Places filter over lens to make color separation when copying color work. Sets automatic timer and starts exposure. Rolls exposed section of sensitized paper into developer tank inside machine and presses lever to cut section from roll. Turns crank to transfer print to pan of hypo (fixing fluid) attached to machine. Examines print for sharpness of line. Rinses developed print in water and places it in heated drying cabinet, between blotters, or on heated cylinders of roll-drier. Trims excess margin from dried print, using cutting blade.

PORTRAIT PHOTOGRAPHER (professional and kindred occupations) D.O.T. 143.062

Also see job descriptions for: **camera artist, cameraman, photograph maker**

Photographs persons and makes photographic negatives from which prints can be developed, using studio-type camera. Consults with customer to obtain information for photographic details. Arranges equipment, such as lights, screens, and shades, to obtain proper background. Poses subject in position to bring out desirable features. Views subject through camera lens to ascertain if subject is in focus, making necessary adjustments to take picture. Slides negative-plate holder in camera to take picture. Cautions subject to remain motionless. Removes protective screen from plate holder by sliding it upwards. Grasps and squeezes shutter-control bulb to expose plate. Removes negative from camera for development.

PORTRAIT PHOTOGRAPHER APPRENTICE (professional and kindred occupations) D.O.T. 143.062

Also see job description for: **cameraman apprentice**

Performs duties as described under apprentice.

SCIENTIFIC PHOTOGRAPHER (professional and kindred occupations) D.O.T. 143.282

Also see job description for: **biological photographer**

Photographs plant and animal tissue and microscopic specimens of food, oil, metal, and other products and develops negatives to provide pictures illustrating industrial and scientific processes and phenomena. Places particle of material on slide or flat surface under lens of photomicroscope to be photographed. Views specimen through camera lens to check focus. Presses lever to open shutter and expose film. Plans setup of equipment and procedures to meet unusual situations, such as use of infrared or ultraviolet light to produce visible record of normally invisible phenomena. Prepares solutions and chemicals used in developing plates and films. Writes degree of magnification on back of each picture. May act as consultant to organizations concerned with problems in such fields as aerodynamics, ballistics, biology, engineering, and metallurgy. May perform additional duties in particular field, such as medicine.

STRIPPER (printing and publishing) D.O.T. 971.381

Also see job description for: **negative turner**

Strips (removes) developed photographic negative film from glass or film base and remounts it, in reversed position, on another glass plate for use in preparing photoengraving plate. Pours rubber solution and collodion over glass or film base to toughen negative. Dries base and cuts negative to size, using knife and straightedge. Immerses glass or film base in acid bath to loosen negative. Strips negative from base and remounts it, in reverse position, on glass plate. Rubs negative with blotter to remove excess water and to insure adhesion to plate. Strips color negatives, using layout or blueprint (transparent film with faint blue image) as guide to obtain register for colors. May spot pinholes and block out areas with opaque paint and artist's brush. May be designated according to type of negative stripped as stripper, black and white; stripper, color.

SECTION 2.7

Related Jobs by Worker Trait Groups

This section is intended primarily for use in career guidance activities. The lists of jobs presented here are categorized according to the principal worker trait groups associated with the still photographic technician career field. These groups relate to the qualifications profile and the inventories of job tasks and learning objectives.

Jobs are arranged numerically according to their complete Dictionary of Occupational Titles (D.O.T.) code number. (See Section 2.5 for an explanation of the codification system used in the D.O.T.) The jobs listed may be drawn from any number of three-digit groups within each Occupational Group Arrangement. This section presents only the base and defined related titles. For a complete listing of all undefined, related, and alternate job titles within each Occupational Group Arrangement, the user is directed to the D.O.T.

05	**Social Sciences**
052.	**History**
052.381	Archeological Assistant (professional and kindred occupations)
10	**Museum, Library, and Archival Sciences**
102.	**Museum and Related Work**
102.381	Museum Technician (museum)
14	**Art Work**
141.	**Commercial Art**
141.031	Director, Art (retail trade)
141.081	Advertising Lay-Out Man (professional and kindred occupations) Color Adviser (motion picture) Stipple Artist (printing and publishing)
143.	**Photography**
143.062	Cameraman (radio and TV broadcasting) Photographer Apprentice, Commercial (professional and kindred occupations) Photographer Apprentice, Portrait (professional and kindred occupations)
149.	**Art Work, not elsewhere classified**
149.031	Supervisor, Scenic Arts (motion picture) Silhouette Artist (professional and kindred occupations)

29	**Miscellaneous Merchandising Work**
298.	**Display Work**
298.081	Display Man (retail trade)
96	**Amusement, Recreation, and Motion Picture Work, not elsewhere classified**
962.	**Motion Picture Production, not elsewhere classified**
962.288	Editor, Film (motion picture)
962.381	Light Technician (radio and TV broadcasting)
962.884	Film Splicer (motion picture)
962.885	Film Technician (motion picture)
962.887	Film Loader (motion picture)
963.	**Occupations in Radio and Television Production, not elsewhere classified**
963.382	Teleprompter Operator (radio and TV broadcasting) Video-Recording Engineer (radio and TV broadcasting)
963.887	Cameraman, Assistant (radio and TV broadcasting)
969.	**Miscellaneous Amusement, Recreation, and Motion Picture Occupations, not elsewhere classified**
969.687	Film Inspector (motion picture)
97	**Occupations in Graphic Art Work**
970.	**Art Work Occupations, Brush, Spray, or Pen**
970.281	Airbrush Artist (professional and kindred occupations) Airbrush Artist, Photography (professional and kindred occupations) Photograph Retoucher (any industry) Photograph Finisher (any industry)
970.381	Ben-Day Artist (printing and publishing) Colorist, Photography (any industry) Tinter, Photograph (any industry) Engrosser (professional and kindred occupations) Inker and Opaquer (motion picture) Retoucher, Photoengraving (printing and publishing)
970.781	Spotter, Photographic (any industry)
970.884	Airbrush Operator (printing and publishing) Colorer (printing and publishing) Painter, Airbrush (any industry)
971.	**Photoengraving Occupations**
971.281	Etcher, Hand (printing and publishing)

971.381	Etcher Apprentice, Photoengraving (printing and publishing)
	Plate Maker, Zinc (printing and publishing)
	Stripper, Black and White (printing and publishing)
	Photoengraving Finisher (printing and publishing)
	Proofer, Black and White (printing and publishing)
	Proofer, Color (printing and publishing)
	Screen Maker, Photographic Process (any industry)
971.382	Photographer, Photoengraving (printing and publishing)
	Step-and-Repeat Man (printing and publishing)
971.684	Film Masker (printing and publishing)
	Film Painter (printing and publishing)
	Negative Checker (printing and publishing)
971.782	Stencil Operator, Photographic (printing and publishing)
971.885	Printing-Chase Operator (electronics)
972.	**Lithographers and Related Occupations**
972.281	Process Artist (printing and publishing)
	Lithographic-Color-Artist Retoucher (printing and publishing)
972.381	Composer (printing and publishing)
	Plate Maker (printing and publishing)
	Lithographic-Press-Plate-Maker, Photomechanical (printing and publishing)
972.382	Photographer, Lithographic (printing and publishing)
	Cameraman (printing and publishing)
	Photographer, Wet Plate (printing and publishing)
	Photolithographic Process Man (printing and publishing)
	Xerography-Machine Operator (any industry)
972.782	Plate Grainer (printing and publishing)
972.887	Plate Setter (printing and publishing)
976.	**Darkroom Occupations, not elsewhere classified**
976.131	Film Technician (motion picture)
	Laboratory Chief (any industry)
	Laboratory Manager (any industry)
	Photographic Foreman (printing and publishing)
976.381	Developer (any industry)
	Color-Laboratory Technician (any industry)
	Photographic Sensitometrist (motion picture)
	Projection Printer (any industry)
	Reproduction Technician (any industry)
	Sound and Laboratory Engineer (motion picture)
	Timer (motion picture)
976.387	Densitometer Reader (motion picture)
976.687	Photo Checker and Assembler (any industry)
	Color-Print Inspector (any industry)
	Reversal-Print Inspector (any industry)
976.782	Color-Printer Operator (any industry)
	Film Developer (motion picture)
	Film Printer (motion picture)

976.782	Multiple-Photographic-Printer Operator (any industry)
	Rectification Printer (any industry)
976.884	Carbon Printer (printing and publishing)
	Chemical Mixer (motion picture)
	Contact-Frame Operator (printing and publishing)
	Film Cutter (any industry)
	Mounter, Hand (business service)
	Negative Cutter (motion picture)
	Negative Cutter-and-Spotter (any industry)
	Screen Photographer (wallpaper)
	Splicer (any industry)
976.885	Developer, Color Photography (business service)
	Developing-Machine Operator (motion picture)
	Film-Drying-Machine Operator (motion picture)
	Mounter, Color Film (any industry)
	Print Developer, Machine (any industry)
	X-Ray-Developing-Machine Operator (medical service)
976.886	Photograph Finisher (any industry)
976.887	Film Loader (any industry)
	Film Numberer (any industry)
	Photographer Helper (any industry)
	Print Washer (any industry)
979.	**Occupations in Graphic Art Work, not elsewhere classified**
979.130	Blueprinting-and-Photocopy Supervisor (any industry)
979.137	Finishing-Room Foreman (printing and publishing)
979.138	Production Supervisor (printing and publishing)
979.381	Copy Cameraman (any industry)
	Silk-Screen Cutter (any industry)
979.382	Photostat Operator (any industry)
979.387	Print Inspector (business service)
979.782	Blueprinting-Machine Operator (any industry)
	Proofing-Machine Operator (printing and publishing)
979.884	Map-and-Chart Mounter (printing and publishing)
	Impression Man (printing and publishing)
979.886	Print-Shop Helper (printing and publishing)
979.887	Photolith Operator (any industry)
	Photostatic-Print Cutter (any industry)

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